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Practical Tips For Planning Networked Studios

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Cover Story

Practical Tips For Planning Networked Studios

by Clark Novak – Marketing Manager, Axia and Telos

It's been 10 years since Ethernet first poked its head into the broadcast plant as a means of connecting devices, studios – even buildings – with linear audio + logic via IP. Audio-over-Ethernet isn't a new idea anymore, it's an established fact: One RJ-45 delivers multiple two-way audio channels, sophisticated control and data capability, and built-in computer compatibility – with system sizes of up to 10,000 channels possible!

If you're considering networking your studios' audio infrastructure, here are some tips to help ensure your journey is a smooth one.

Size Your Network Switch by Counting Interfaces, Not Pairs

In the old days, when I/O was discrete, you needed to know how many audio cable "pairs" your new studio would require. A typical studio could have 100 to 200 pairs of stereo audio cables, depending upon the size of the studio and the number of inputs and outputs it hosted. But many pieces of modern studio gear come equipped with Ethernet ports that allow you to connect them directly to your studio's edge switch, or the system's core switch (typically located in your TOC).

Example: older phone hybrids had separate I/O for send and receive audio and Program-On-Hold, along with GPIO for taking and dropping calls, activating tallies, et cetera. New systems can replace all that discrete I/O with one CAT-5 cable that carries audio + logic. So, in the example of our phone system, networking replaces 3 audio pairs and an 8-conductor cable with one Ethernet patch cord.

If you have newer studio peripherals, chances are good that some are network-ready. You can re-deploy them in your new studio using their networked-audio connections. This is why you should count interfaces rather than pairs; the number of devices that connect via Ethernet directly affects the capacity of the network switch you'll buy.

Of course, not all gear will have a direct Ethernet connection. For these, you'll need devices that translate their discrete audio and logic to routable Ethernet audio. These interfaces are generally high-density devices that aggregate multiple channels of Stereo audio, which they then deliver to the network via CAT-5. Knowing how many interfaces you'll need will, again, help determine the capacity of the network switch you'll purchase.

Make Sure It's Secure

Security is essential to all data networks – doubly so if the data you're protecting is your Program feed! You will have 100% security if you keep your audio system completely isolated from any other network, local or wide area. If you're very concerned with protecting the studio system, you may want to take this approach.

But there are advantages to sharing with, or linking to an office network. You can configure and monitor the system from any connected PC, and audio can be monitored on any desktop with access. In this case, separate switches or VLANs (Virtual LANs travelling the same physical network) can be used to provide isolation. An IP router passes only the correct packets from one to the other, providing a neat firewall.

Connection to the public Internet brings the advantage of being able to monitor and configure from a remote site. The downside, of course, is the risk of unwanted intruders, viruses, etc. If you want this kind of connectivity, set aside some budget for a qualified network engineer to help you place an appropriate firewall and other protections in place – most networked broadcast gear is not designed to keep out brute-force attackers.

Choose The Right Cable

This is very important! Ethernet is balanced and transformer coupled, so it has very good resistance to interference and has no problem with ground loops. However, frequencies ranging to tens of megahertz are being used, so you still need to be careful. You don't need to splurge, but you definitely don't want to cheap out in this department.

Ethernet cabling is classified by "category." The most significant difference between cables from each category is the number of twists per foot and the tightness with which the twists and the spacing of the pairs to each other are controlled. The wire pairs in a voice-grade Category-3 cable usually have two twists per foot, and you may not even notice the twists unless you peel back a lot of the outer jacket! Category-5 is tightly twisted, something like 20 per foot. This results in superior crosstalk performance at higher frequencies.

Let's take a look at the cable Categories you'll encounter while planning your studio network:

- **Category-3:** This is used only for telephone and slow 10Base-T Ethernet connections; it's not at all the proper grade for the 100/1000Base-T connections used in IP-Audio networking. Avoid it like the plague.
- **Category-5:** 100 ohm unshielded twisted pair, specified for network speeds up to 100 MHz. These are generally what you'll find on J-hooks at Home Depot or Best Buy, because they support Ethernet 100BASE-T. Getting better, but still not the cables you want for your audio network.
- **Category 5e:** This is enhanced Category-5 cable. The main application is for Gigabit 1000BASE-T. While CAT-5 is acceptable for 1000BASE-T, 5e is officially preferred. It's also the minimum preferred Category cable for your IP-Audio network.
- **Category 6:** While not strictly necessary except for 1000BASE-T links, we recommend CAT-6 for all new studio installations, if it fits within your budget. CAT-6 provides significantly higher performance than that of CAT-5e. The main difference is that this cable has a plastic pair separator inside that holds the wires in correct relation to each other. This is what makes CAT-6 larger in diameter than CAT-5 cables. If your budget does not allow for the use of CAT-6 exclusively, be certain it's used on all Gigabit links, while CAT-5e carries the rest.

Another characteristic of twisted-pair cables is the type of insulation used on the wires and the cable jacket. "Plenum rated" cables are more stable with changing temperatures due to their using Teflon rather than PVC insulation. Plenum rated cables are required in air handling spaces in order to meet fire regulations. Teflon produces less smoke and heat in the case of a fire than PVC, and does not support the spread of flames.

Space is limited here, but if you're interested in reading more on Category cable selection, Belden's Steve Lampen has written an excellent piece on the subject, which you can read at **http://axiaaudio.com/cable**

Keep Your Balance!

IP-Audio studio equipment, coupled with the highly-twisted CAT-5 or -6 cable we've been discussing, works very well in the balanced pro-audio environment.

Of course, it's inevitable that some jock will want to connect his iPod or some other consumer-grade device to the network as an audio source. If you need to interconnect your balanced-audio network to unbalanced gear, use a balanced-to-unbalanced buffer amplifier or transformer located as close as practical to the unbalanced equipment. Several manufacturers make matching devices to bridge the gap between the RJ-45 balanced and consumer-unbalanced worlds. They're inexpensive, and offer plug-and-play compatibility with major IP-Audio systems.

Call Your Delivery Provider

Consumer-grade sound cards are noisy, unbalanced and don't have GPIO-logic capabilities. Luckily, nearly all major playout system providers now offer OEM drivers that interface their playout software directly to IP-Audio networks via the playout computer's NIC. Which means no more tangled multi-pair pigtails or bagful of connectors to solder up – multiple channels of audio (up to 24, depending upon your playout system and audio-network capability), along with stop/start logic, can travel over one CAT-5e connection to your switch, thence to be loaded to faders on your studio console. This native PC-to-network signal-density goes a long way toward simplifying studio infrastructure, especially if you have several studios to install.

If you need some of the more esoteric capabilities that professional sound cards provide (such as time-squeezing or expansion), well-known makers such as AudioScience can supply cards with these capabilities – which also connect directly to the network via CAT-5. Talk with your delivery system provider to find out which option best suits your needs.

Make Friends With Your IT Department

In the old days, the mixing console was the heart of your studio. But with an IP-Audio network, the heart is the network switch, and selecting the proper one is of utmost importance.

Every IP-Audio network manufacturer maintains a list of Ethernet switches they've tested and approved for use with their studio equipment. If you have an IT Department, they may have their own ideas about what switch you should be using, but it's essential that you use the switches recommended by your system's manufacturer, and configured in the manufacturer's prescribed way, for proper performance. We can easily cite instances where IT departments insisted on selecting their own switchgear, or configuring it in a way that differed from the audio networking manufacturer's spec, and paying the price in lost time, audio errors and other distressing problems.

The bottom line is that you should always use a switch that has been selected and tested by your system's manufacturer. Using a recommended switch will also help you should you need customer support, because your provider will be familiar with it. And bring your IT guy a cup of his favorite hot beverage now and then; it's better that he's with you than against you.

Clark Novak is the Marketing Manager for the Axia Audio and Telos Systems brands of the Cleveland, Ohio-based Telos Alliance. Clark's background includes nearly 20 years immersed in day-to-day radio operations as a program director and on-air personality, where he became intimately familiar with studio equipment and computer systems. After his on-air tenure, he spent time at Pacific Research and Engineering before joining the Telos organization. Based in San Diego, Clark has tirelessly promoted the benefits and advantages of studio networking technology since helping launch Axia in 2003.

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Channeling Your Inner Mixer

When Knowing the Broadcast Console is Just Not Enough

George Zahn

One of the most fun things about this column is the ability to span from new technologies to "old school," and sparking discussion between engineers and managers of all generations. Just as I was about to talk myself out of this old school topic, I did a career inventory and realized that, amazingly, more than half of the stations at which I've worked have had production rooms with non-standard mixing consoles – meaning multi-channel consoles.

So this one is dedicated to the engineers who can navigate the console that many have called the "airplane cockpit" of audio. For many stations, multi-channel consoles are a staple of production studios – some are left over from stations that once produced live music. When newbies see the array of knobs and dials, they may feel as confused as a chimp turned loose with a parametric equalizer.

In actuality, if someone told you a multi-channel console is complex, they're fibbing. My goal is to demystify these consoles, so that even those of us who have been corralled at our local church or theatre group to run a multi-channel console, simply because "well, you're in radio, you must know these things...", can operate a basic multi-channel board.

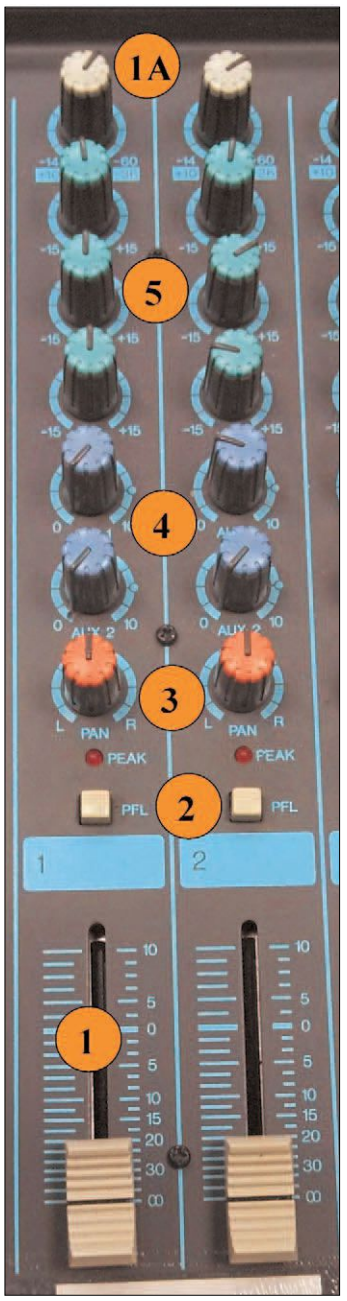
First let's talk about what makes these consoles different. Unlike a broadcast console that allows simple mixing of stereo or mono levels, the multi-channel console allows you to mold the audio of each input. Basic multi-channel consoles have multiple mic or line inputs, possibly a set of submix designations, and then generally, a stereo output. These three areas are designated as something like 24x4x2, meaning *24 individual inputs, 4 submixes*, to allow groupings of some of the 24 inputs to single faders (an example might be mixing a bunch of drum microphones to one submix, then using that submix to control the volume of the whole drum kit). The final *"2" number* represent the Left and Right stereo outputs.

Larger consoles often have more than 24 inputs, usually in intervals of 12. If a console doesn't have any submix options, there will not be a middle number. A 24x2 mixer has 24 unique inputs and a simple left-right output. Pretty basic so far.

The largest concentration of the knobs and dials are on each of the input controls. If you understand one of those input strips, you understand most of the multi-channel console. To make it easy, I have pictured two input strips from a basic console that has multiple inputs and a simple stereo output.

The idea is to not only control the volume of each input, but to also have the flexibility to "color" or equalize the audio coming into each input. Let's deal with volume first. You'll notice that I have two labels, 1 and 1A. These two controls regulate audio level in the channel. Each mic coming into the console enters a mic pre amp for that channel. The Trim Pot (1A) is almost always at the top of the strip and controls the volume *before* the pre amp. The Fader (1) controls the audio level *after* the pre amp.

Most all multi-channel consoles have a "peak" light for each channel. Whether you're mixing a discussion or a music session, monitoring each input's level constantly is a chore. The peak light flashes as the channel approaches a distortion point and warns you when you're close to clipping at the preamp. Most new users want to grab the Fader (1) to fix that, but only the Trim Pot (1A) can alleviate potential clipping by dropping the audio level before the pre amp.



Notice also that the Fader levels show a "0" (zero) setting. This is the design center for the console – the point at which the fader's optimum signal-to-noise ratio is set. You can use the Trim Pots to set all the used faders at "0." This helps if someone comes up and moves your faders when you're not watching. If your Trim Pots are set so that each fader is at zero, you can easily recover an accidental bump of a fader or faders.

Regular users of multi-channel consoles know that there is a Cue or Preview. When using headphones (and some speaker systems), you can use the PFL (Pre Fade Listen) button (2) to isolate into the headphones only that input or any selected inputs with the PFL turned on. This is used more commonly in music for live equalization or troubleshooting on a specific channel's input.

The final overall volume control is the Pan Pot (3). When mixing music, it obviously allows distribution of that individual channel's level between the left and right outputs. This allows layering of instruments such as multiple mics on pianos, drums, etc. It also allows you to make a nice stereo spread for talk programs on which you're mixing host and guest microphones. There won't be a quiz later, but the Pan Pot is actually short hand for Panoramic Potentiometer.

If this console had a Group Setting, it might well have designations for Groups 1 and 2 and another for Groups 3 and 4. If Groups 1 and 2 are selected and the Pan Pot is all the way to the left, the audio of that channel would go to Channel 1 – totally to the right would go to channel 2. The console shown here does not have that option, but you'd likely find it right above the Pan Pots if there is a Group Mixing option. Larger mixers can have many more groups, perhaps 8, 16, or more.

The blue knobs (4) on our demo are Aux or Send controls. These are used far more commonly when mixing music. Imagine have a nice guitar input coming into the console, but it's rather dry, with no reverberation. You can use the Aux or Send controls to "send" a little or a lot of the signal to an outboard effects device (some multi-channel consoles have built in effects as well), but these dials allow you to send to up to two different devices.

The Send or Aux can also be used to feed an amp for monitors or headphones for music or discussion programs. Check your console's manual. A Pre-Fade Send remains constant in level no matter where the Fader (1) is – even if the Fader is all the way down, audio still comes through the Aux or Send. A Post Fade Aux or Send will allow the Fader (1) to raise or lower what is coming through the Aux or Send.

Finally, we address one of the features which allows the multi-channel console to give us more flexibility. Notice three Equalization Knobs (5). These knobs give us some control over frequency response on each input. These are used more often in music mixing, where you might want to brighten one piano mic while possibly boosting the bass on another input, although it can be used for improving the clarity of a speaker on mic.

The Bass (lower green knob) and Treble (upper green knob) are shelving equalizers. On simple consoles such as this one, the frequency setting is determined by the manufacturer. The Bass may be set at 200 Hz, for example. When the dial is at zero, no change happens – turning the dial to the right boosts all frequencies from 200 Hz down to 1 Hz by the number of dB you select. Turning to the left will attenuate the same frequencies. The Treble control (top green knob) may be set somewhere near 12,000 Hz and changing it will change all frequencies from 12 kHz on up.

The mid-range control is a peak-dip EQ with a preset midrange frequency on this model – likely at about 3 kHz – always check your manual. Some midrange controls will have a second midrange control that lets you "sweep" between upper bass and midrange frequencies. Instead of shelving all frequencies near it, the contour of the audio affectation is more of a bell shaped curve with the set frequency at the middle.

I'm interested to see how many stations are using multi-channel consoles in studio or for remotes. There are many low-cost, multi-channel consoles with as few as one or two mic inputs for simple mixing in various settings. Let me know how you're using multi-channel consoles, or if you've been recruited to help with one of these mixers by local churches or civic groups who need someone with more technical "know how" than the average lay person may have. Good luck and happy mixing!

George Zahn is a Peabody Award winning radio producer and Station Manager for WMKV-FM at maple Knoll Communities in Springdale, Ohio. He is a regular contributor to ***Radio Guide*** *and welcomes your feedback. Share your stories with others by sending ideas and comments to gzahn@mkcommunities.org*

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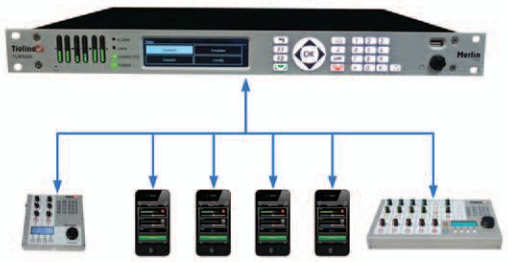

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Facility Focus

Spare Parts

How many is still "Not Enough?"

by Mike Callaghan

While I was going through an outlying station that was once part of my responsibilities, I noticed there was no backup transmitter, and no spare transmitter tube on the shelf.

I asked the station's engineer where he kept the spare tube. He replied, "Oh, we don't have one ... the manager didn't like the $700 just sitting on a shelf not doing anything. We agreed we can do better things with the money."

I said that he needed to order the tube, because the one that was in there now might have a catastrophic failure.

"My Manager said not to."

"Well, I'm telling you to get one."

"Look ... my General Manager isn't going to like some hot-shot engineer from corporate showing up and ordering us around, and besides, this transmitter doesn't have catastrophic failures – so there!"

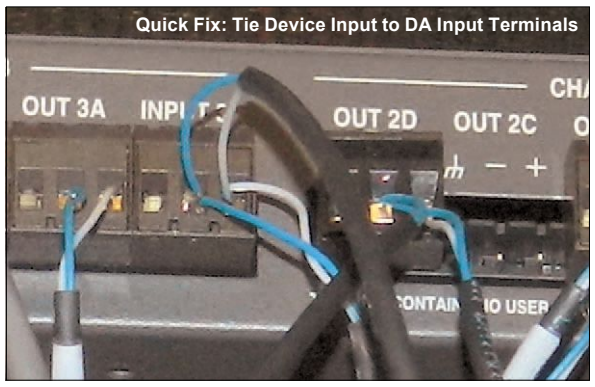
"If you don't order a spare tube, your job is going to have a catastrophic failure."

This really happened, and I have to wonder where this "engineer" is working now?

Would you believe there was a time when the FCC. dictated how many spare tubes you needed at a transmitter site? They were concerned enough with your station staying on the air that they'd write you up if you didn't have enough of each type. While those days are far behind us, you still should have enough spare parts to keep things going when something fails.

DA Down

50 years ago, the fix for a broken DA was easy – you changed a tube. 20 years ago – you changed an IC. Now, you change the entire DA, because changing the bad part takes a lot more than pulling something out of a socket. Fortunately, the internal parts now don't fail nearly as often. But it still happens, and can have disastrous results when it does.



Quick Fix: Tie Device Input to DA Input Terminals

So, what can do you do when you haven't got a spare DA, and a studio's down as a result? Luckily, in a studio where a DA feeds a number of devices, you'll usually find that just one device feed is being used at a time – a CD burner, a studio feed, or a Zephyr – and just one of them is critical. So the work-around is to go to the back of the DA, and tie whichever output you need across the DA's input terminals. You'll probably have to reset the input levels, but the device will still function. If more than one device does need to be fed, you can add loads as needed, being careful not to unbalance the source. This will happen if you tie one of the DA's input terminals to ground. In reality, you should never need this solution, since DA's aren't that expensive, and you really should have a spare.

As a matter of fact, you should have spares for anything that performs a critical task. Not just DA's, but mike processors, CD players, CD burners – anything that can break and stop you dead in the water. Headphone and monitor amps seem to have a special knack for failing at a critical moment and wreaking havoc. If your station has any maturity, chances are you'll have both old and new amplifiers in the mix – and they'll have all different input and output connections. Which makes the pain of swapping them out even more excruciating. You can head this issue off when you have some spare time, by making up adapters so the studio connections to the amps all match each other. This way, when a failure blossoms during a session, you can get the replacement amp functioning before the talent has time to get riled up.

Mike processors are a special case; you really don't want a variety of old, new, and all different manufacturers spread all over the plant. It's better to avoid having to try and make different models and lineages sound like each other. If your station has signature talent, and they use different studios, you need to try and make everything match. Not just the processors, but their specific settings as well. Your on-the-shelf spares should match what's in the studio. It goes without saying that the mikes (and your spare mike) should be the same.

Production processors can affect the sound of each studio just as easily as the mike processors, so they should match as much as possible, and their settings should be similar. High-End rooms used for wild and zany creative production will likely have effects boxes unmatched by anything else in the plant – and that's probably just as well.

Most current consoles are modular, with different modules that can be installed and removed while the board is on the air. That makes it convenient to swap out ones that get noisy or break while they're being used. You should have a replacement for every module on the board. Some control modules can't be swapped without taking the console out of operation. When these go bad, they are the ones you *really* need spares for. Most module failures are mechanical – pots, switches, broken shafts – these are the parts you should be able to change in the field.

The "surface-mount" components are likely to need a trip home to get repaired. This can take the module out of service for weeks. If this is necessary, and you don't have a filler panel for the one that's missing, please cover the opening with cardboard and secure it with screws or stout tape around the edge to keep debris and garbage from falling into the hole!

Unless all your rooms are pretty much the same size and shape, don't worry so much about having different speakers. You'll learn how each room sounds and be able to compensate so the overall result on the air is acceptable.

Spare computer parts follow the same mandate. Different keyboards come with different layouts, and there's no reason all yours shouldn't be the same. Mice are less critical, but why not?

Wireless mice and wireless keyboards have a way of disappearing or getting misplaced, which can leave your air talent with no way to drive the station. Besides, they use batteries, and batteries can die at awkward times. It helps to have a spare mouse and keyboard somewhere in the studio, so if one of them dies, the talent can hopefully get things back in order without waiting for you to drive in on a weekend.

Studio computer monitors are best standardized as much as possible. Your high-priced morning talent might want something special, but try to make the cords and cables match. The pinnacle of aggravation is having to replace a monitor with a plug-in VGA port on the back, while your "spare" has a captive VGA cord. Getting under the table, cutting all the tie-wraps to free the old cord, lacing in the new one, and making it all work during the morning show, is enough to make you drink your lunch. Avoid this by standardizing on the rear-panel VGA port while you have the chance. Another way to save time is unpacking monitors, mice, and keyboards as soon as you buy them. If they're pre-assembled with the cords unwrapped and ready to go, you'll cut precious minutes off the time it takes to get them in place when they're needed.

Headphones suffer a lot in radio studios. The cords get yanked, or run over, or snarled and tangled. Eventually this makes one channel die, and you will be asked to fix them. This can easily be a losing proposition if you make any sort of reasonable salary. If the cord can be replaced, that's the cost-effective fix. If it's permanent, it might be worth trying a new plug on the end of the cord but chances are just replacing them makes the most sense. You can buy 5-packs of headphones from broadcast vendors for under $99, and keep a spare set in the studio for emergencies. If the broken phones are really expensive, that changes the effort you'll spend to make the repair, but I wouldn't want to spend more time and effort then they're worth, in any case.

Another "spare" worth investing in is a universal laptop power supply. Guests and talent from out of town are notorious for bringing the laptop and forgetting the charger. So, just as they're ready to go on and be a star, the battery conks out. You can save the day with the universal charger, but either watch it like a hawk or secure it with a deposit – like a credit card or driver's license. After the session, exchange charger for deposit and everyone comes out ahead.

There isn't really any economy in skimping on spare parts. The stress and cost of having a critical component overnighted to you just isn't worth it. Make a list of equipment and parts critical to your operation, set a realistic budget, and start getting what you need to keep things going. You'll do a better job – and rest easier as a result.

Mike Callaghan is the Chief Engineer at KIIS-FM in Los Angeles, CA. His email is: rg@mike.fm

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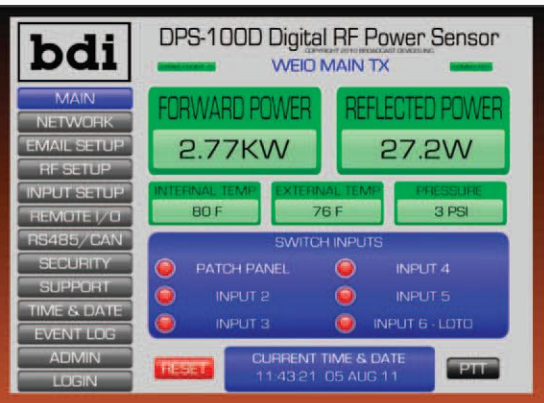

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Station Stories

A Very "Green" LPFM

by Steve Callahan

The FCC's LPFM filing window, which was extended by one day because of a server crash, has just closed and that means a "Tsunami" of LPFM applications will soon make it to public notice. This mad scramble for LPFM authorizations reminds me of a rather unique little LPFM that I once visited. If you are expecting a story about a wind-powered, or even a water-powered LPFM radio station, sorry to disappoint you. This "Green" LPFM is in the Emerald Isle. It's an interesting story that came from an even more interesting visit.

Connemara Community Radio is located in the northwest quadrant of Ireland. It's a region known as Connemara and it's as rocky and barren as the rest of Ireland is lush and green. However, a little background is necessary for you to know the true impact that this little radio station has on its 11,000 listeners.

For many decades, radio services in European countries were operated as an arm of their official governments. In Ireland, that meant that the RTE (Radio Television Eireann), was the only legally sanctioned radio channel. You've probably heard of Radio Caroline in 1964, which was a popular, ship-based pirate AM radio station that was anchored three miles off the coast of England. Radio Caroline spawned more ship-based pirate stations which then operated as an alternative to the BBC. In later years, the British government licensed independent broadcasters which spelled the end to the shipboard radio pirates.

In Ireland, the first commercial radio broadcast was heard in 1916. From that time, until 1989, the airwaves were dominated by the RTE national service which consisted of RTE1, a news service, then RTE2, a spoken word service. Later came Lyric FM, a national classical formatted station, and then the Gaelthacta, or traditional Gaelic service, which serves the Gaelic-speaking regions.

In Ireland, the current national radio service is provided by a network of small FM stations which are linked by way of RBDS format coding, so that your car radio seeks out the next strongest station with the same Program Code, as you travel through the regions. However, in Connemara, there is a tall mountain range known as the Twelve Bens, or Twelve Pins, which runs from east to west, and effectively blocks FM signals from the south.

This signal blockage was the impetus for a group of people in 1988 to start a pirate radio station north of the mountain range, and to call it Connemara Community Radio. It lasted for only six weeks, and operated live from 11:00 am to noon, and 4:00 to 9:00 pm. But Connemara Community Radio provided local radio service to an area where there was no national signal or, at the very best, spotty national coverage.

Unlike in the U.S., where our FCC has determined that former pirate radio broadcasters are not eligible for a proper license, the Irish government said that the pirate radio folks in Connemara had actually provided a valuable public service, and in 1995 they granted a license to them to continue to operate.

I was in Connemara and of course I had to check out the AM and FM radio offerings, as I do anytime I travel. I was amazed at the many open spots on the FM band in the region. However, aside from the national RTE offerings and now some independent commercial stations, I heard some very interesting and unique sounding programming on 87.8 and 106.1. Yes, you read it correctly, the FM band in Europe extends lower than in the U.S., along with different channel spacing.

The more I listened, the more I was fascinated by their programming, which was so very different from the commercial station offerings. Their locally produced shows ran the gamut from the death notices to children's programs. I just had to visit this little station and see for myself what they did and how they did it.

Pat Walsh on Right

It took a little time to connect with Pat Walsh, the station manager, but he kindly agreed to meet with me and gave me directions to the studios. Remember, this region is very desolate and Pat's directions had me going off into the countryside away from Clifden, the nearest town. He told me to look for the Connemara National Park and the station was on the right just past the park's entrance.

Paul Phelan at the "desk" or control board.

Lo and behold, just past the park, was a small group of buildings and I could tell from the STL antennas that Connemara Community Radio was in the front building. I was warmly welcomed and given the tour of their impressive offices and studios which broadcast from 11:00 am to 9:00 pm every day. In the U.S., the facilities at most LPFM stations are modest and utilitarian. Here, Pat showed me several well-equipped studios and a very impressive technical rack area that housed processing and STL equipment for their two transmitter sites, as well as program servers.

The studios had what appeared to be commercial grade broadcast equipment, mostly of European origin. The offices and studio facilities took up two floors of their building and one thing which surprised me was a live performance studio which also doubled as a classroom for the training of local people to produce their own radio shows. Pat said that they had to emphasize local involvement and training as part of their licensing requirements. Another licensing requirement that Pat shared was that Connemara Community Radio has to regularly record and send real-time copies of their programming to the Broadcasting Authority of Ireland.

Many of you might remember the old "composite weeks" we used to have to assemble for license renewal in the U.S., which demonstrated to the FCC the percentage of entertainment, public affairs, public service and other programming that our stations broadcast. Pat has to regularly send real time "air checks," – not just at license renewal time – to demonstrate that Connemara Community Radio does indeed produce local programming of local interest.

Two young "presenters," as announcers are known in Europe.

An unexpected treat for me was the opportunity to participate in a live interview show. Pat, along with a very well trained board op, interviewed me on the differences between "community" radio stations in the U.S. and in Ireland, of which there are now 20 such local stations located around that country.

When I left Connemara Community Radio, I was really enthused at what 90 volunteers had built to provide local radio programming to the people in their coverage area. Despite what I thought were some fairly strict requirements placed on them by the government, their programming was live, local and pertinent to their region. When I got back home, Pat was kind enough to send me a file of a program that they had produced which looked at the Titanic disaster from the perspective of local people who had lost family members who were immigrating to the U.S. but never made it.

The main reason I remembered this little Green LPFM was that I sincerely hoped that some of the many LPFM license applications that are now in the hands of the FCC will someday get on the air and operate with the same concern for their listeners, and that some would take the time and effort to develop formal training programs for their volunteers, and not just rely on a CD player set to shuffle.

If you'd like to listen to Ireland's oldest community radio station, go to www.connemarafm.com. I think you'll agree that they are doing something special which would translate well to us in the U.S.

Steve Callahan, CBRE, AMD, is the owner of WVBF, Middleboro, Mass.

FCC Focus

Revitalizing AM Radio

by Peter Gutmann

Amid all the customary self-congratulation of this year's NAB Radio Show, an uncommon focus turned to the revitalization of AM. Yet, analysis and reflection suggest that the measures under consideration are more of a temporary fix than a permanent solution and that more radical steps will be required to ensure the long-term viability of the AM segment of the radio industry.

The most welcome news was the Notice of Proposed Rulemaking announced and promoted by FCC Acting Chairwoman Clyburn. Even during the Radio Show, engineers and others immediately began to question the practical utility of the proposals.

(Please note that this column is being written during the FCC shutdown, prior to release of the NPRM and disclosure of its particulars. Even so, much already has been written about the details of the NPRM, so perhaps only a brief summary is appropriate.)

Relaxation of the Community Coverage Rules

This is designed to allow AM stations to relocate their sites and modify directional patterns to cover less of their communities of license, both daytime and nighttime. FCC staff routinely has been granting waivers to heritage stations seeking site changes in situations where annexation has expanded city limits well beyond the areas they initially had to cover. The current proposal should afford further flexibility, including moves to better cover actual listening in light of demographic and population shifts. Yet sufficient suburban land may not be available and values may be too pricey for the size of tracts required.

Easing AM Antenna Efficiency Standards

This also is intended to promote flexibility by allowing the use of shorter antenna towers. Yet it raises similar concerns as to whether the cost of a facility change can be justified for a marginal operation.

Elimination of the "Ratchet Rule"

No longer requiring a reduction in nighttime interference is apt to provide further flexibility for facility changes. Proponents of this change note that the rule was created in anticipation of receiver improvements that never materialized. Yet while elimination of this rule may increase coverage, it would not reduce interference, which remains a primary goal of AM improvements.

MDCC Implementation Upon Notification

Modulation-Dependent-Carrier-Level control technology has proven itself as one of the most effective and successful new techniques, enabling significant savings in input power (and electrical bills). In lieu of requiring experimental authority or a waiver, the NPRM proposes authorization of MDCC upon mere notification to the Commission. Despite concern over audio distortion there have been few listener complaints, and so implementation would seem to be a judgment best left to individual licensees who must balance their financial and audience needs.

Special Translator Window for AM Licensees

Enthusiasm for this proposal quickly withered in the harsh light of reality. After awarding CPs to the remaining qualified applicants from the 2003 translator window, and once the LPFMs are processed, the availability of channels seems doubtful, especially in the most congested markets where they are most needed. So unless the Commission finds a way to change the laws of physics, this remains little more than a mere abstract policy aspiration.

Although apparently not included in the NPRM, several other suggestions have been floated to revitalize the AM band. These include eliminating clear-channel AM skywave protection, as even the owners of these facilities concede that they attract far too little long-distance listening to justify suppression of hundreds of local stations' night-time signals. Several pending petitions for waiver propose loosening the FM translator "minor change" rules to allow more extensive moves in order to reach under-served pockets of AM reception. (The current restrictions generally require overlap of licensed contours or sites proximate to AM primary stations.) Other proposals urge relaxing or eliminating the main studio rule (and its staffing requirement), in recognition that radio is no longer required to fill a role as the exclusive source for breaking local news.

Few would argue that regulatory neglect of AM is long overdue for redress. While management of the spectrum remains an essential role of the FCC, increasing recognition is being given to the competitive environment in which other platforms are providing alternatives to the services for which the public had relied upon radio. The expansion of technology, in turn, should enable broadcasters generally, and AM stations in particular, to find niches driven in large part by commercial feasibility, rather than to satisfy outdated requirements based on providing universal service. (Indeed, one might argue that the relationship of radio to the FCC has shifted radically in recent years, away from elaborate efforts to weigh the "public interest" to a procedure that virtually guarantees license renewal upon payment of annual regulatory fees. In that light, it would seem that commercial considerations should govern station moves. But I digress …)

As many (especially engineers) increasingly pointed out as the Radio Show progressed, while the measures under consideration could provide much-needed temporary relief, they fail to address the inherent limitations of AM technology. Chief among these is the burgeoning interference from man-made sources, including smart phones, which effectively precludes reception of AM in such devices. (You don't really want to dangle an outboard ferrite rod antenna as you walk down the street, do you?) In one technical session, the panel suggested that a power increase of ten times (with a corresponding electric bill) would be needed to rise above the current noise floor, which promises to keep mounting. The prospect for wide-band receivers to surmount the perception of AM as a low-fi also-ran seems caught in a spiral of cost, need and a dearth of high-quality audio.

But even aside from those inherent limitations, much has been written lately about how many AM stations have drifted severely out of spec, whether through aging equipment, deterioration of ground systems or overlooking needed maintenance. As they wait for FCC inspectors or buyers to uncover derelictions, many licensees are unwilling to devote the funds necessary to invest in remedying technical deficiencies in their plants.

Due to these and other issues, the long-term prospects for AM broadcasting as we know it do not seem bright. Rather, it seems that a bold vision is needed to not only revitalize but reinvent AM. But those prospects present their own set of challenges.

Conversion to an all-digital format has many seeming advantages. It would overcome much of the noise problem and provide competitive sonic fidelity. By eliminating the need for any protection other than co-channel it would permit a tighter packing of the band with more stations, greater coverage and closer sites. It would also be far more energy-efficient, converting about 70% of input power to useful signal (as opposed to analog AM's measly 5% or so of its carrier that is used for audio modulation). Unfortunately, much of this is merely theoretical, as the few tests of a pure digital AM system have been merely "promising" (and the far less efficient hybrid system presents severe, and perhaps unsolvable, nighttime issues).

The other long-term solution is migration to a higher slice of the spectrum, but to where? Although portions of the current TV band seem the most likely candidates (especially channels 5 and 6), its availability depends upon the outcome of the repacking auction procedure, which is years away and highly uncertain, as it is to be voluntary and will depend upon procedures yet to be determined. Engineers further note that unless migration is combined with a transition to an all-digital format, far too much spectrum will be needed. A final, political issue is that, unlike digital TV or the TV repacking proposals, AM has nothing of value to trade for new spectrum, as its current band has no significant worth for other uses.

The overriding problem with these long-term solutions, as promising as they may be, is the need to replace the vast universe of analog AM receivers, which would become useless for either digital broadcasting or migration to another frequency band. Regrettably, a lesson has yet to be learned from HD radio – industry leaders truly don't seem to grasp why consumers continue to resist replacing their $5 table radios with a $200 HD set to receive the same old stuff. Unless replacement receivers are made available for a relative pittance, any forced conversion could risk losing much if not most of the current AM audience.

Yet a solution to AM's problems must be found, and without delay. Some have suggested that perhaps we should face the inevitable and concede that AM's sun is setting. Some have even proposed, in apparent seriousness, that marginal AM stations be encouraged to shut down in order to get out of the way of regional and clear channel stations. But far too many folks out there continue to depend for vital service upon AM, and especially from those very stations that are most in jeopardy.

In any event, while the initiatives currently under consideration demand attention, a permanent fix seems inevitable. That, in turn, will require a radical change of direction and bolder thinking by broadcasters, regulators and consumers.

A few final questions – Why was nearly every speech, meal, award or other major function at the NAB *Radio* Show introduced by a dynamic, attention-grabbing *video* – and not just this year? (Indeed, radio spots proudly presented by the key speaker at the advertising luncheon were just the audio from TV spots that depended heavily on their video for necessary context, and seemed utterly meaningless when heard in isolation.) Isn't radio supposed to rely on the powers of audio to stimulate our listeners? Isn't that our major selling point which we try to impress on advertisers? Do the leaders of our industry (or at least the convention planners) truly have so little confidence in the inherent strength of their own medium?

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Science of Sound

Acoustics and Radio

by Jeff Johnson, CPBE

We are in an information business – the radio business. All of our efforts rely on hearing. Our success in this business depends on the clarity, and pleasure, of that hearing.

Have you ever walked into an anechoic space? Disorienting, isn't it? Nothing is to be heard! Have you ever been in a cacophonic space, such as a factory? Equally disorienting, isn't it? Sound coming from nowhere, or sound coming from everywhere, is each misinforming.

Product	Thickness	Mounting	Density	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
703	1-inch	on wall	3.0 pcf	0.11	0.28	0.68	0.90	0.93	0.96
705	1-inch	on wall	6.0 pcf	0.02	0.27	0.63	0.85	0.93	0.95
703	2-inch	on wall	3.0 pcf	0.17	0.86	1.14	1.07	1.02	0.98
705	2-inch	on wall	6.0 pcf	0.16	0.71	1.02	1.01	0.99	0.99
703	4-inch	on wall	3.0 pcf	0.84	1.24	1.24	1.08	1.00	0.97
705	4-inch	on wall	6.0 pcf	0.75	1.19	1.17	1.05	0.97	0.98
703	6-inch	on wall	3.0 pcf	1.19	1.21	1.13	1.05	1.04	1.04

As radio broadcasters, we must understand acoustics in order to excite or inform our listeners.

Defining "acoustics" according to Merriam-Webster: *"The qualities of a room (such as its shape or size) that make it easy or difficult for people inside to hear sounds clearly"-or- " the science that studies sounds."*

Acoustics is now considered a science, although it can be argued that acoustics is still an art. Consider that fabulous acoustic spaces were created long before there was any such "science." Carnegie Hall in New York (1891), Music Hall in Cincinnati (1878), and Sorg's Opera House in Middletown, Ohio (1891) are acknowledged examples of successful listening environments.

Many of us, particularly non-commercial broadcasters, transmit not only our voices from our studios, but also live music performances. These two acoustic forms demand quite different environments. Hosts speaking into a microphone should be in an acoustically "dead" space, while musical performers should be in "live," somewhat echoic surroundings.

How are these environments created and controlled? The absorptive or reflecting characteristics of walls, floors and ceilings must be designed properly. The shape of the space and its defining surfaces are critical, but consideration must also be paid to interfering sound being transmitted into the space.

Reflection is rather simple to understand. Too much of it results in a confusion of sound. Reflections are heard with variably delayed timings. Reflections will vary also by frequency. They can enhance, detract from, or confuse perception. An example is a "boomy" room. Too much bass bouncing around, of course, causes that boom.

A method of controlling bass is introducing "bass traps" (No, this has nothing to do with fishing!) – bass traps can be narrow-band or broadband. Where does the energy go? Well, conservation of energy dictates in this instance that it becomes heat.

Simple Absorption Bass Trap

A simple broadband bass trap acoustic panel is described by Joel DuBay of Ready Acoustics: *It consists of a core of two or more layers of 3 lbs. pcf (per cubic foot) density, 2" thick, semi-rigid fiberglass board (Owens Corning 703 or denser 705). Covered with acoustically transparent fabric (grille cloth), these 'soak up' acoustic energy. Logically, thicker is better. A chart describing absorption at differing frequencies and thickness with the absorber mounted flat on the wall or ceiling is at:*

www.subsonicsam.com/703_705_coefficient_charts.html

Where 0.00 = 0% absorption, 0.50 = 50% absorption, and 1.00 = 100% absorption.

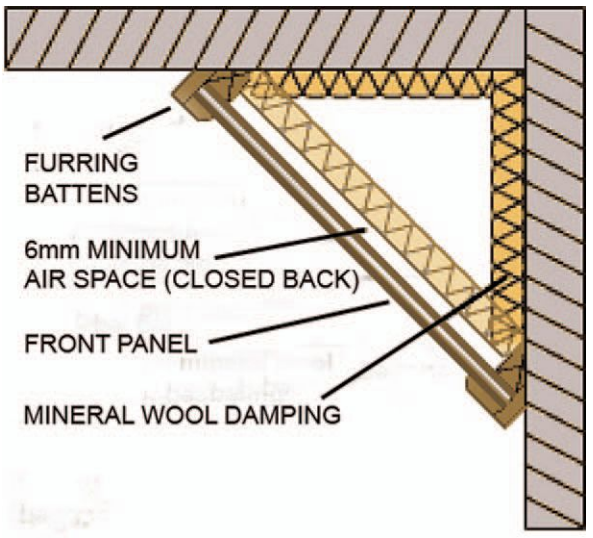
It can be seen that 703 marginally outperforms 705. 6 inches of 703 soaks up almost everything. Well, all frequencies above 125 Hz. But that is not the *real* bass.

Membrane Bass Trap

Brandon Drury describes membrane bass traps at: **www.recordingreview.com/blog/recording-studio-construction-acoustics/why-your-bass-traps-dont-work/**

Membrane bass traps work by stretching "deadsheet" or even plywood over a sealed area with 703/Roxul stuffed inside. These have to be tuned specifically, but they can absorb very deep frequencies without chewing up a ton of space in your studio. Also, they avoid the HUGE problem that occurs with an excessive number of broadband absorbers in the room. They reflect high end back into the room keeping the room from sounding "stuffy."

Why are such bass traps usually in a corner? Custom Audio Designs explains at: **www.customaudiodesigns.co.uk/basstrap-basic-design-principles.html**



Cross section of a corner membrane bass trap.

Bass frequencies tend to collect in the corners of a room, so in a small room where space is at a premium it's best to build or place Bass Traps in the wall/ceiling soffits. This also makes the maximum use of the extra depth available and because an angled panel, across a corner, has a varying cavity depth, the frequencies that are absorbed will be even wider than those of a constant depth absorber.

Thinking about this, it is the opposite of a resonant panel soundboard meant to project sound – it acts to soak up sound in its resonance range. It is commonly called a "limp mass bass absorber."

Commercial versions of this type can be found at: **http://realtraps.com/p_megatraps.htm**

Megatraps Take Over

Helmholtz Resonator Bass Traps

Also from Brandon Drury: *When tuned lower, Helmholtz Resonators can be very, very effective at absorbing low frequencies.*

Hi-fi buffs remember the bass-reflex speaker baffle. It is a Helmholtz resonator designed to enhance the low frequency performance of a loudspeaker by resonating at a frequency lower than the resonance of the woofer cone. It therefore emits from its port a constructively interfering acoustic wave.

A Varitune Helmholtz bass trap (Performance Acoustics Labs).

As a bass trap, the Helmholtz resonator can be used to soak up bass frequencies. A resonator can be tuned to a troublesome frequency to dampen that frequency in the room.

So how does this relate to broadcast? Let's continue this subject in the next column, as it relates to radio studios and performance spaces.

Jeff Johnson can be reached at: jeff@rfproof.com

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Translator Topics

FM Translators for AM Stations

A Lifeline or Anchor Line?

by Edward (Ted) Shober, PE – Radiotechniques Engineering, LLC

The FCC now permits AM stations to rebroadcast on FM Translators. This has been received to great acclaim by AM operators. It provides a high fidelity output for AM stations, and a presence on the FM band in markets where many people, especially young people, don't even realize that there is an AM button.

The FCC is attempting to help AM stations through a new, FCC Notice of Proposed Rulemaking, MB Docket 13-249. This Rulemaking effort is being led by Commissioner Pai in genuine concern for the fate of the 4,790 AM stations struggling under the burdens caused by radio noise sources, terrible AM receivers, a crowded band and antiquated regulations. The Rulemaking seeks to improve the regulatory environment and offer AM broadcasters a place "first in line" for FM translators.

Unfortunately, typical of many government agency actions, the FCC sees a problem and rushes to a "fix" before analyzing it. Make no mistake, an FM Translator window can be a big help for some primary AM stations, but there are several aspects of the "solution" that should be reviewed before opening a window:

A single translator may help in small market radio situations where only a small area needs to be covered to be effective. When a typical AM station gets a translator, the AM station and the translator will generally have widely differing service areas. The AM station, for example might have a 20 mile radius to its 2 mV/m contour, but the translator only goes 7 miles. The station promotes the anemic translator because it has a nice sounding signal, but it covers only 12% of the area of the AM station. This is a prescription for failure because the translator cannot cover enough of the market to be viable, and the listeners will be confused about the identity of the station – noisy AM or weak FM.

The FCC's proposal of "one to a customer" rules are foolhardy. AM Stations should be permitted as many translators as is needed to fill in the AM Station 2 mV/m contour, especially when there are no competing applicants.

Unfortunately, in many places there will not be enough FM translators to go around. Translators occupy the left over bits of spectrum after full service FM stations are allocated. In many areas there are no opportunities for new FM translators, especially after the LPFM window, when most of the "nooks and crannies" became occupied by LPFM stations.

FM translators that rebroadcast by AM stations may use up to 250 Watts effective radiated power (ERP) at whatever tower height they are located, as long as they don't cause interference. This is a different standard from that applied to "satellators" or translators that operate outside the service area of their primary station. The power of these translators is restricted when the translator is on a tall tower, particularly east of the Mississippi and in California. Translators may receive interference, but not *cause* interference – not only inside the full service FM stations's licensed service areas, but also wherever they might have some listeners. Unfortunately, this means that many translators accept interference from the full service stations, LPFM stations or older translators. A translator receiving interference will have an effective service range less than the normal 60 dbμV contour. This means that these translators will provide even less benefit to a primary AM station.

Since a single FM translator is at best an assist to an AM station, and potentially a significant hindrance, what could be done to make them effective? The goal is to deliver as complete an FM signal as possible, to a meaningful proportion of the of the AM station's 2 mV/m contour. This is the only standard by which AM stations can maintain a meaningful presence in the market. What possible remedies are available?

- More Translator Power
- More Antenna Height
- More Translators
- Single Frequency Networks

More power. That is always good, isn't it? Don't limit translators to 250 Watts! But there is a problem – most new translators will be on second or third adjacent channels to stations in the same market. To locate a translator so it will avoid interference to these adjacent channel local FM stations, requires low power and a tall translator antenna. To utilize 250 Watts near the edge of a second or third adjacent channel FM station's service area will require at least a four-bay antenna and a center of radiation of 130 meters or more above ground – requiring a pretty tall tower. A large antenna on a tall tower is an expensive project in terms of construction costs and monthly rent.

Most AM stations's towers are shorter than ideal, and there are not that many tall towers, so finding an suitable tower within the AM station's coverage area may not be possible.

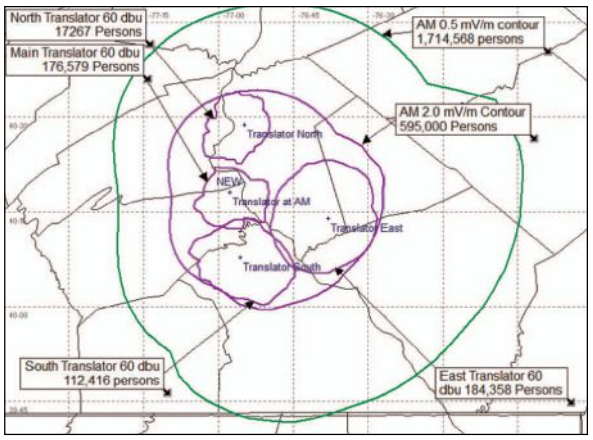
Even though the maximum power for translators is 250 Watts, they are usually limited to lower power in populous areas because an FM translator must still protect all FM stations, translators and LPFM stations according to the FCC rules. The translator power must often be reduced, or a directional antenna used to achieve this protection, as well as keeping the translator coverage inside the AM 2 mV/m contour.

More antenna height is a common solution to limited translator coverage. This is great if a tall tower is available and the tower rent is affordable. A tall tower makes it easier to protect second and third adjacent channel stations, but does nothing to improve squeezing in a translator when the FM stations needing protection are co-channel or first adjacent to the FM Translator frequency. For co-channel interference, tall towers actually make the situation worse, because the Translator's interfering signal will go further in proportion to its 60 dbμV contour than for a shorter tower and more power.

More translators seems like a pretty good idea, except for two problems: Listeners are mobile, and there are rarely enough channels to go around. Each translator can cover only a small portion of the AM Station's coverage area. If an AM station had three translators on different frequencies, in different areas, promotion would be a nightmare – with a total of four frequencies and different coverage areas. Automotive listeners would need to program four different buttons to be able to enjoy the station when driving around the AM service area – the AM station for coverage between the 2 mV/m and the 0.5 mV/m, and three different FM frequencies – depending on where the listener happens to be driving. There are European automobile FM receivers that can automatically tune among stations in a multi-frequency network, using RDS technology, but I am unaware of its use in the USA.

One great opportunity for improved translator use by AM stations is the use of single frequency networks. Single frequency networks are made up of several FM translators within the fill-in contour of the AM station – all operating on one frequency. The individual translators must be synchronized with each other, using the same technology used for FM boosters. A single frequency network of fill-in translators would work much better than FM boosters. Because an FM booster operates within the service contour of the primary station, the translator network would have only a little overlap of their service contours, causing much less mutual interference.

Taking the case of a moderate power (2.5 kW) mid band AM station, with a directional antenna in an eastern market. (This happens to be a pending application for a new station at the FCC.) The map below shows the stations's coverage contour, and the coverage from potential translators that the station might have (from real towers).



The population within the AM stations's 2 mV/m contour is over a half million people, including the most of the Neilsen Counties' population. Unfortunately, a translator at the top of the stations's tower, using a full 250 Watts and an omnidirectional antenna, covers only 30% of population in the AM station prime selling area, and only 26% of the Arbitron Market Population. Market penetration at this service level is useless.

A constellation of four translators operating in a single channel network, however, covers a mostly un-duplicated population of 490,276 people, more than 82% of the AM stations's 2 mV/m. This would provide meaningful FM coverage to the market.

Another advantage to a single frequency network is that the added coverage comes with little additional interference potential. The system 40 dbμV co-channel interference contour (the cochannel protection level for classes A, C, LPFM and Translators) is largely contained within the AM station's 0.5 mV contour. The "East" translator's 40 dbμV nuisance contour is 836 square km by itself, while the entire system of four translators nuisance contour encompasses only 1016 square km – only 21.5% additional area, while covering 166% more people. This will allow more FM translators to be allocated in adjacent markets, likely to be able to share one channel because of the decreased interference potential.

Unless the FCC permits AM stations to use multiple FM translators, and authorize single frequency networks of translators to thoroughly fill in the AM primary station 2 mV/m contour, the good intent of providing FM translators to AM stations will be ineffective, and may be destructive at worst.

Ted Schober, PE, is a consulting engineer and owner of Radiotechniques Engineering, where he has designed, filed FCC applications and upgraded the transmission facilities of over 300 radio stations since 1979.

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Step to the side.
Dirt and liquids: a console's most hated enemy. Element foils 'em with premium, side-loading conductive-plastic faders: dirt drops past, not in.

Built to last... and last, and last.
Element modules are machined aluminum with wear-resistant Lexan inserts for long life. We've even designed custom-molded guides to prevent tears around the fader slot. No "ouchies" here.

Unlimited vision.
Some console makers give you "switched meters" to save costs. iQ does away with that annoyance: high-rez OLED displays meter all 4 buses at once.

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Clients rave about them, talent loves them: over 5,000 on the air makes Axia radio's favorite IP console.

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Our meters aren't just good-looking; they're designed specifically to convey the most information possible at just a glance. And Axia consoles support VU and PPM metering styles - something you might not find on consoles that cost a lot more.

Big power, small price.
Radius loads you up with 8 faders, 4 mix buses, automatic mix-minus, onboard EQ and voice dynamics and more — for just $5990 USD. Shh... don't tell the accountants.

Rack 'em up.
Turn your Radius 8-fader console into a rack-mount powerhouse. Great for OB vans, performance studios, concert remotes and more.

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Unlike those other guys' small consoles, DESQ has an event timer and an NTP-capable clock — built-in, not extra-cost. Because time is money (pardon our pun!).

Small but mighty.
DESQ packs big console power into just 18" square. 6 faders, 2 buses, automatic mix-minus, Show Profiles and more. Perfect for standalone or networked studios.

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No "plug-n-pray" unmanaged switches here; Axia builds our own custom zero-config, built-for-broadcast network switch right into our PowerStation and QOR console engines.

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In fact, we calculate that thanks to our huge selection of frame, module and mixing engines, there are at least 32,209,982 different ways to order an Axia console. With that many options, you'd better get started now! Mmm... don't you just love that new-console smell?

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State of the Station

Do You Really Want to Adopt That Station?

by Mike Callaghan

OK, you're a successful free-lance engineer, with a half-dozen or so stations on your roster. They've been well cared for and don't cause a lot of problems.

Then the phone rings; it's a new station owner, and he wants your help. He just acquired a new property, and he wants you to care for it. The money sounds enticing. What are you going to tell him?

Accepting responsibility for a station you don't know much about can be a serious issue. There's a reason the new owner didn't just keep the previous engineer around. Before you decide to take the station on, you'd be well advised to go see what would be involved. If you don't know the new owner, you need to be aware there are unscrupulous owners that will hire you just long enough to clean up a mess someone else left, only to let you go as soon as the heavy lifting's done and the station's back on track.

Neglect compounds itself in a radio station. Equipment that's been ignored goes from bad to worse very quickly. I've seen stations that were lucky to be on the air at all – the equipment was so bad, and bringing it back from the edge of the cliff would take a very long time and a lot of effort.

In one case, the transmitter, a 5 kW Collins AM, had matchbook covers blocking the overload relays open so the transmitter couldn't shut itself down when the tubes arced over. The fiberglass air chimneys on the three high power tetrodes had virtually disappeared due to arcing.

As you start exploring what will be involved in taking over, remember to look for the following:

• **The manuals for the equipment** – including addendums and field service bulletins. Make sure the schematics are intact and complete.

• **Transmitter spare tubes and parts.** Verify the spare parts are for the right transmitter! I've seen boxes full of parts for rigs that were abandoned decades ago!

• **Concise records of work done and parts replaced.** A chronological listing of the history of the transmitter, from the installation to current day, is really important so you'll know the strong and the weak points. Some transmitters just have inbred weaknesses and they're predictable, and can be prepared for in advance. These records also should include:

1. Modifications that have been made. Sometimes these are the result of field service bulletins, and other times exact replacement parts aren't available. In any case, something that makes the equipment non-stock should be obvious as soon as you open the manual.

2. Dates that tubes and limited-life transmitter parts have been changed. Such parts as air filters, memory batteries, and obviously, tubes, should be noted so to insure spare parts will be on hand as needed.

• **Remote Control Designations.** A chart with metering and control functions belongs at the transmitter, the studio, and at your house!

• **Studio wiring and signal flow diagrams.** These include charts and equipment lists for each studio. If these are on hand, expect at least some of them to be obsolete; equipment changes happen all the time, and it's unlikely the charts are all current. Console input designations are also likely to have been changed. While inaccuracies here aren't critical, you should plan on spending some time making these match reality well enough so that you can trace signals and find dead inputs.

• **The all-important EAS logs and records, and LP-1 and LP-2 assignments.** Because these involve the FCC, these are critical. If you'll be the designated Chief Operator, problems with these represent real dollars and cents to the owner, and he will depend on you to keep these in perfect shape and ready for inspection.

• **A healthy and well-organized Public File** (if this is your domain as well). Many owners realize the difficulty of being fully-knowledgable about the Public File and will hire external help to keep the file in proper order. There are additions that must be made regularly, as well as program notes and public correspondence. Specialists are available at reasonable cost to either accept responsibility for this or at least to help the station staff keep it organized and ready to be inspected. Public File issues are the downfall of many stations during inspections, so you have a right to ask for help if this is part of your responsibilities.

Along with all these records, you'll also want to ask about:

- *Which local suppliers the station has accounts with.*
- *Keys and access instructions to the transmitter site(s).*
- *HVAC service contracts and contact information.*
- *Hotline, office, and transmitter phone numbers.*
- *Corporate engineering contacts, if there are any.*
- *Contact info for the previous engineer.*

(Continued on Page 22)

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State of the Station

Do You Really Want to Adopt That Station?

– Continued from Page 20 –

- *Hospital and Workman's Comp contacts in case of injury.*
- *Tools and Test Equipment that belong to the station.*
- *Remote equipment: mikes, Zephyrs, PA gear, tents, banners.*

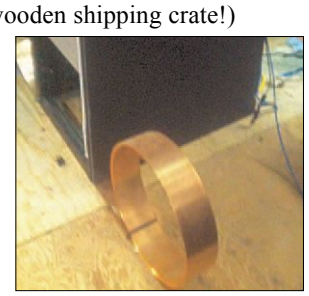
Each of these may be a part of your responsibility. It's best to know how far this extends before you become the "go-to" guy and end up looking ignorant when you haven't been oriented.

Once you've been over these items, you'll want to do the Physical Inspection:

At the Transmitter

Is the transmitter grounded? Is there ground a copper strap to a solid station ground?

Is the transmitter lagged down to the foundation or just sitting in place? (I've seen operating transmitters still resting on the base of the wooden shipping crate!)



Are the racks also grounded with a copper strap? Are they bolted to the floor – are they bolted to each other? Are there power strips secured inside the racks or are there Waber boxes hanging from the ceiling? Are the racks on their own circuit breakers? If there's a dry transformer, has it breakers on the input and the outputs?

Are the RF cables supported correctly on trestles? Don't laugh, I've seen stations where the feed lines were held off the ground using *paint cans!*

Is the wiring traceable, or just a jumbled mess? Are there labels on the cables to identify them? Are there taped splices in the middle of cable runs, rather than genuine connectors?

Are the remote control connections neat and well dressed? Are the control functions and the metering cables separate and easy to trace? You don't want to get stuck some night trying to figure out why a function's not working amidst a jumble of impossible-to-sort conductors.

Are the power cords dressed? Are long cables coiled neatly or just dangling onto the floor?

Are the critical pieces of equipment (i.e. exciters, remote controls, etc.) running on UPS's? They should be.

How long has it been since the towers were painted, and is rust visible?

Has the guy cable tension been checked recently?

Has the quarterly tower inspection been done and entered in the station and maintenance log?

Are the FCC required tower registration signs the right size and are they in place?

At the Studio

Are the studios fairly clean and well laid out? Are the cables between them simple to trace and follow? Is the equipment serviceable and not too old to service and find parts for?

Is the furniture intact and in good repair? Are the racks secure? Is the rack wiring neat and well routed? Is the rack equipment serviceable? Is the EAS equipment working properly for both sending and receiving tests? Are the mike booms serviceable? Are the consoles and controls intact? Is the phone system working correctly? Are there enough spare parts to keep everything running in an emergency? Are there spare headphones and mikes, computer keyboards and mice?

As you review these different documents, features, and necessities, you'll need to remember that it will likely be yourself that will need to bring them into being if they're missing. You'll develop an idea about how long it will take and how much effort will be involved. These projects will be above and beyond the routine maintenance and repair tasks you should anticipate after they're finished. So you should bring them to the attention of the owner or manager before accepting a maintenance contract, and then work out a reasonable cost in either hours or dollars to compensate for the extra effort.

If the facility is a real disaster, you'll need to decide if the extra responsibility and effort is worth it. You'll want to think twice if the management wants it all cleaned up as a part of the monthly stipend, because, as we pointed out earlier, there are managers that will use you just long enough to set things straight, and then suddenly have 'budget issues' or other reasons they can't afford your help. Chances are, though, that if you are diligent and keep things flowing smoothly, the air staff and the other staffers will continue to support you and you'll find yourself becoming needed, appreciated, and happily employed for a long time to come.

Mike Callaghan is the Chief Engineer at KIIS-FM in Los Angeles, CA. His email is: rg@mike.fm

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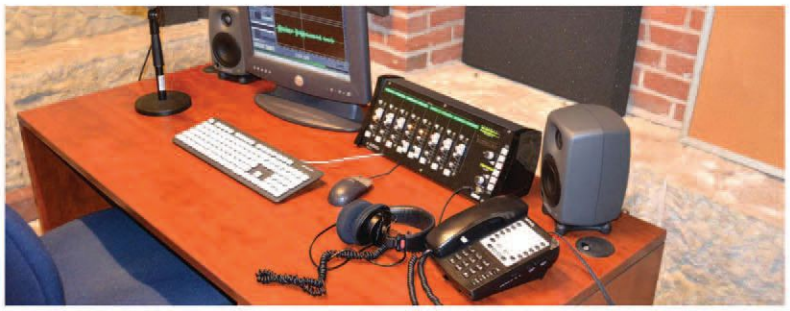

Office Suite Makes SWEET Remote Studio

WUIS-FM in Springfield, Il has a reporting team that wanted an office-like feel for their new remote studio digs at the state capital...

...and that's not all. Greg Monfroi, the CE for WUIS-FM, said he was asked by management to come up with a solution for the new morning talent who was having a difficult time adjusting to his early sunrise schedule. A no-show could be a big problem...

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OK, this spread is an advertising space paid for by Wheatstone. But hopefully you'll find it informative, entertaining and compelling.

What You Need To Know About Today's Radio Consoles - Part 1

Every console tells a story...including yours!

We know plenty of broadcasters who have nicknames for their consoles. You might be one of them, in which case you won't hear any comments from us. W hat you call your board is your business. We just hope that you keep it respectable.

Because with any luck, and a little respect, that radio console will be around for a long, long time. Still, every decade or so it's a good idea to pop your head up from the controls and see what's out there. You might be surprised to learn that consoles haven't changed all that much on the surface, although some of the changes we've made under the hood could make a difference in how big and how cool your next console will be.

Simple Maintenance Tips For Consoles

It doesn't really take all that much to keep your console good as new.

It'd be easy for you to make the assumption that consoles won't last as long as they used to. But you'd be wrong. There's a whole lot of staying power in our consoles, even our smallest one, the Air-1. Which means you're not off the hook as far as maintenance goes. Fortunately, very little maintenance is required of today's consoles.

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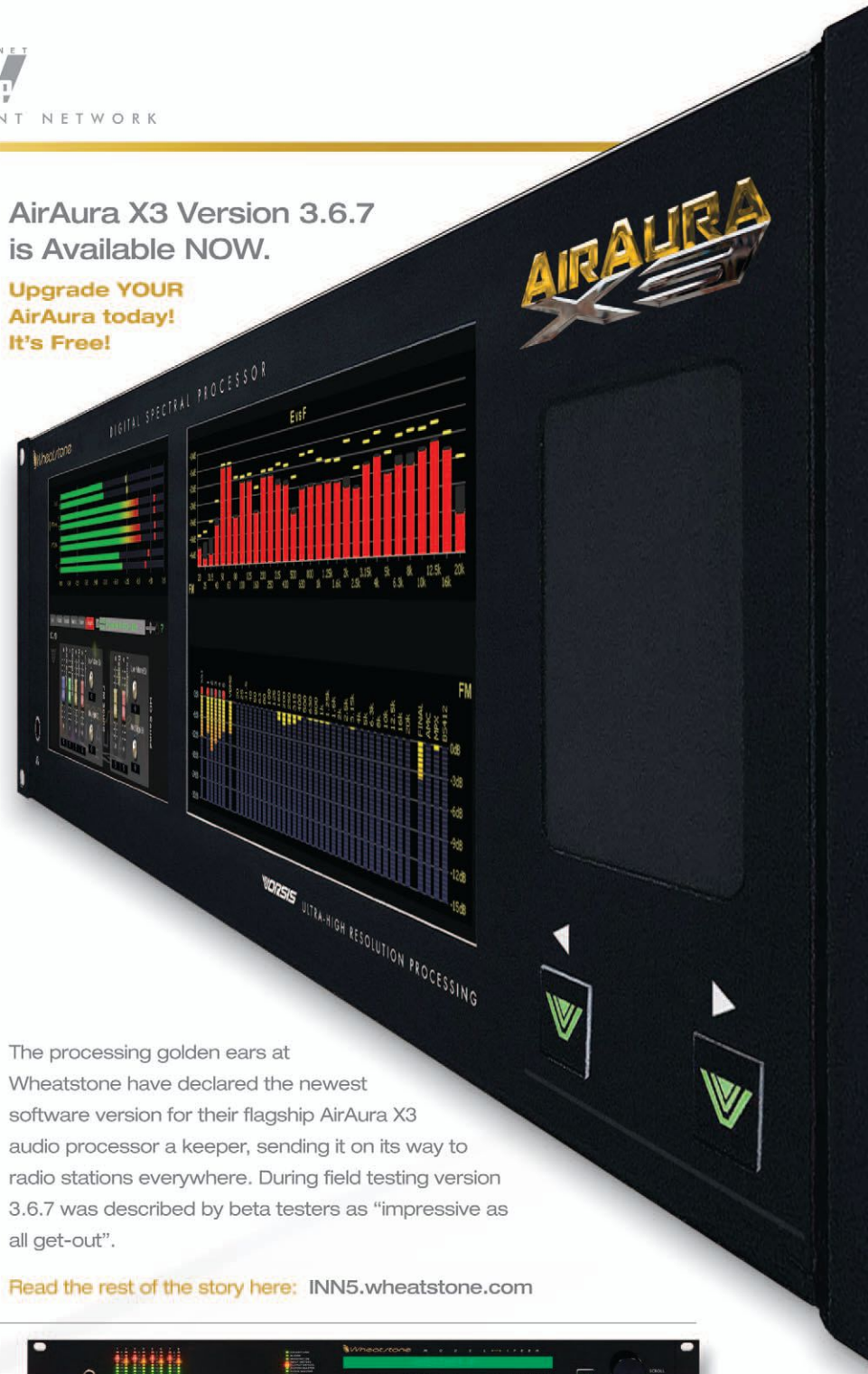

The processing golden ears at Wheatstone have declared the newest software version for their flagship AirAura X3 audio processor a keeper, sending it on its way to radio stations everywhere. During field testing version 3.6.7 was described by beta testers as "impressive as all get-out".

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Read the rest of the story here: INN5.wheatstone.com

Chief Engineer

Time For a Cool Change

by Scott Schmeling

One of our stations had been running a Continental 816R-3 transmitter since early 1982. The 816R-3 is a great transmitter, but unfortunately, ours had a history of "issues," and when the latest one developed, it was decided a new transmitter was in order. Plus, it didn't have any VSWR foldback, so every time we had snow and ice, we had to monitor the reflected power and manually lower forward power to keep it on the air! The 816 would now become the backup.

We started "transmitter shopping" and decided on a Nautel NV30LT. The NV30LT has a number of features and advantages that make it a good choice. First, it's solid state and modular. Solid state means no tubes to replace, and the modular design means that if RF Output modules fail we stay on the air at somewhat reduced power. The Nautel NV line also offers a web interface, meaning if you have Internet service at your transmitter site, you can log on to the AUI (Advanced User Interface) from virtually anywhere, and monitor nearly every parameter of the transmitter, as well as perform basic remote controls. We were really diving head-first into the 21st century!

Before the new box arrived, there was work to be done – Nautel provides very extensive Site Preparation and Pre-Installation Manuals. There were a few things to check at the site. First, we had to be sure the transmitter would fit through the door. Fortunately, the building has a double-door, so that was not a problem, and there was just a small step up to get into the building. We also had to be sure there was a place to put the transmitter when it got here. Unlike many transmitter buildings, this one was nice and roomy. A quick check of the electrical service showed the power feed was fine. In fact, another 25 kW transmitter had been wired in by the previous owner, but never used – we planned to use that fused disconnect for the new Nautel.

One other item we needed to check was air handling. The 816 tube transmitter generated a *lot* of heat. At normal output, the exhaust temperature usually ran about 160 degrees. That heat was routed out of the building via a 12-inch round duct. There was also a nice big 8-1/2 ton air conditioner (thanks to a previous owner), more than enough cooling for the soon to arrive Nautel.

Since the NV30LT has RF power modules instead of tubes, there's no high velocity blower. Instead, there are several small fans inside the cabinet, moving air across (and dissipating heat from) each of the modules and power supplies. Our plan was to configure a closed system, since the air conditioner was more than adequately rated.

Delivery Day

Shortly after the order was placed, I spoke with the shipping company to coordinate delivery. One thing I specified was that the delivery truck must have a lift gate – with a lift gate, the transmitter could be lowered to the ground. I also asked for a call, a day or two prior to delivery. When the big day came, I met the truck at the site. As specified, the truck did have a lift gate (thank goodness). We off-loaded the transmitter onto the cement slab in front of the door. I forgot to mention, the driver also had a pallet mover. Good thing, too, because we needed it to maneuver the pallet/crate from the front of the truck to the lift gate. This thing weighs a *ton* – literally – the paperwork says it weighs 1,960 pounds, and that's close enough! Anyway, we were out of the truck and in front of the doors. So far, so good.

Now to move it inside the building ... nope! No matter what we tried, we could *not* get the pallet inside. Unfortunately, that "small step" I mentioned earlier was just too much. And if we *had* gotten it inside, we wouldn't have been able to slide it into position anyway. And this thing weighs a ton – remember?! To get over this hurdle, we called a local moving company. Admittedly, I should have made arrangements with them in the first place – my bad.

The "moving crew" arrived with a Rol-a-lift and an 8-foot lever with wheels on the end. The Rol-a-lift is a two-piece system; each piece has a hydraulic jack, one piece goes on each end, and they are held to the unit being moved by a strap. After assessing the situation, the work began. It's *amazing* what a difference having the right tools makes. With the Rol-a-lift and lever (and two strong moving men) the transmitter was eased precisely into position.

Once in Place – the Fun Began

For the installation, I enlisted the assistance of Marv Olson, a friend and fellow engineer. Marv and I work so much alike it's sometimes hard to tell who did what by looking at it.

This was more than simply a transmitter installation. Our task was to get the new Nautel transmitter wired and ready to go, with minimal interruption of the transmission of the Continental. And since the Continental would become a backup, there was also a coaxial switch to install.

(Continued on Page 28)

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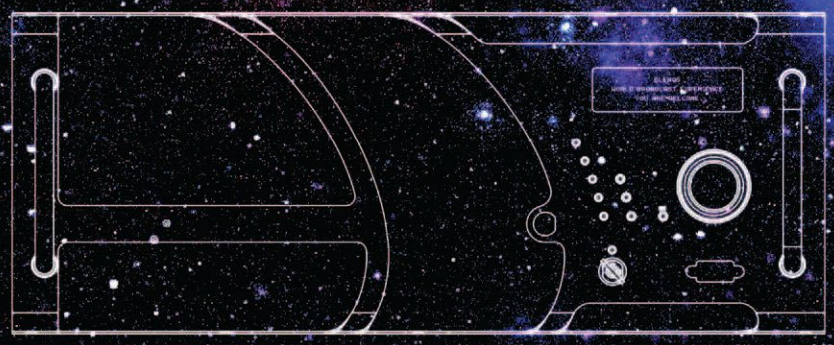

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Chief Engineer

– Continued from Page 26 –

Plus, the Sine remote control system would get another relay panel and be reprogrammed for Nautel Main / Continental Backup.

First, we planned the position of the Myat Coax switch, to be roughly halfway between the two transmitters – and the Heliax should reach it, too. To mount the switch, we secured two pieces of strut to the ceiling, with two additional pieces mounted to those two pieces, to form a somewhat adjustable mounting assembly. Four pieces of 5-foot long, 3/8-inch threaded rod went from the strut to a mounting plate. After the switch was at the right height, the excess rod was cut off. By the way, a mounting plate is available from Myat, but I had one fabricated at a local metal shop, since one had not been included with the switch.

Positioning of the switch was critical, because it was connected to the two transmitters by 3-inch rigid line. We decided to mount the switch at an angle rather than "square," to eliminate the need for an elbow on each line. We tied a piece of string around both transmitter's output ports to assist in positioning the switch

Once the switch was in place, we measured and cut the rigid line to the sizes needed. I have used the "hose clamp cutting guide" in the past. That's where you tighten a hose clamp around the tubing to be cut, and the stainless steel band becomes a guide for your hacksaw. But considering the number of cuts we had to make, I bought a mitre saw and replaced the blade with a cutting disc instead. Compared to the hacksaw method, these cuts are much faster and very square. We were using flangless elbows and fittings, and the inner conductors were cut 1-1/2-inches shorter than the outer conductors to allow for the bullets. Yes, I could have used a "chop saw," but the combination mitre saw will probably get a lot more use in the long run and, therefore, a better investment

We placed a rack between the transmitters (and below the coax switch) to hold the forward/reflected meter, coax switch controller, and remote control. Obviously, there was cabling between the rack and both transmitters. Rather than lay the cables on top of the transmitters, I bought some wire closet shelving. It was wider than needed, so we cut it down the middle, then hung it from the ceiling using hanger bolts and threaded rod. The cables are lying neatly in the trays and the cost was about $35 – rather than $150+ for actual "cable troughs."

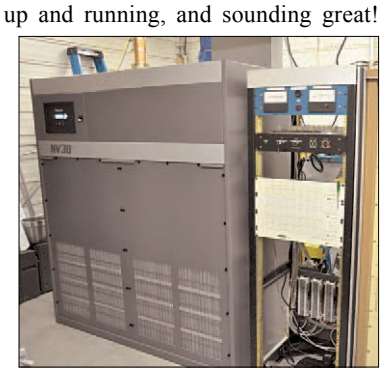
Since we were re-doing the remote control, we decided to run everything through punch blocks. Marv did an outstanding job mounting the blocks on a hinged rack panel and wiring *all* of the telemetry and control functions. Now, if anything needs to be changed in the future we can do it on the blocks rather than re-wiring the system.

Wiring of the transmitter was fairly straight forward. There was some confusion regarding the digital inputs (controls) and outputs (monitoring) largely because, as is sometimes the case, documentation trails manufacturing. But that was eventually cleared up with the help of Brendan Tipney of Nautel's tech support.

Once the wiring was all completed, we started the commissioning process. That's a step-by-step sequence of instructions to verify proper operation and wiring of the transmitter.

After applying power, the instructions directed us to the display. Problem was, the display was not lighting up! We checked and double-checked – everything we did was correct. After a long conversation with Joey Kloss at tech support, it was determined that our transmitter had the UPS option factory installed – however the documentation did not indicate we had that option. Because of this, power is not wired to the "Low Voltage Power Supply" – the UPS is supposed to do that. But I didn't *know* I needed a UPS. However, Joey was able to tell me how to by-pass the option. Once that was done, everything came up the way it was supposed to and the commissioning went just like it should. Thank you so much, Joey!

After making the switch, it just took a few adjustments and everything was up and running, and sounding great! We've already had one minor snow and ice event. I called the transmitter frequently and did see the reflected increase for a while. Probably not enough to have taken the Continental down, but I'm sure I'll have more chances to observe. My biggest surprise was how much quieter the Nautel is than the Continental. I wish I had a sound level meter to see just how much quieter it is – now I can actually hear myself think.



As winter approaches, I am now looking forward to *not* having to travel on icy roads to reset an overload and put the old transmitter back on. I may even be able to enjoy a "long winter's nap." Until next time, keep it between 90 and 105 ... and Merry Christmas to all of you and your families.

Scott Schmeling is the Chief Engineer for Minnesota Valley Broadcasting. You may email him at: scottschmeling@radiomankato.com

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Tower Topics

The Truth of Towers

Part 1 – Tower Basics

by Leonard Weenou

A while back, during a big series of snow, cold and ice events that took place nationwide, I participated in several conference calls organized to develop contingency planning in case of a structure or antenna failure at some of my client broadcast stations.

In most of these calls, sort of like Jacque Cousteau, "suddenly I came upon a murky archipelago of misconceptions and misunderstandings" – which in this case concerned towers, their design and construction.

The first time this subject came up it took me about an hour to cover the facts and bring everyone to fully understand the realities of the situation, basically using a Question and Answer format. I took some notes as points were reached or passed, so that we could return and explore them more fully before closing.

Each time the issue came up with a different group, I added more notes, etc. By the last of these conversations with different groups, going from the notes pretty much allowed me to cover the topics right along in a straight line fashion. In fact, this series of articles is a direct result of those conversations.

A good place to begin might be with something like the **Eight Basic Facts About Towers** that, as you will see, relate to all towers.

Towers 101

Fact #1: The design of a tower is always worked backwards from its *projected loads* and from its *fixed location*. Keep that in mind: loads and location.

The loads include antennas, lines, lighting, elevator, signage – whatever you want to put up there, and the elevation, weight and size of each. The location factors include some important – and site-unique – items, such as soil type (the ability to bear the weight of the loads) and base elevation (which in conjunction with its susceptibility to high wind as well as the location's latitude generally identify the weather environment).

Fact #2: There is no best or strongest tower between the choice of a guyed or self-supporting tower. Each has their strong suit of capabilities and assets *but none is intrinsically stronger than another*. Tower structures are strong by design.

Fact #3: The forces that act upon a structure trying to stand up in the air are the same on any tower, guyed or self-supporting. The greatest force is usually the wind resistance presented by that structure, followed closely by its own weight (tower, antennas, ice, etc.) and the related overturn moment (its desire to fall down when it is not perfectly balanced straight up in the air) created by its own weight and dynamic factors.

No matter what type of tower you have, you have to resolve those forces. For that reason, at least initially, the calculations to identify those forces are the same for any tower.

Fact #4: Towers fail because of overstress, not because of who made it. This overstress can be plain and simply because the people using that tower have exceeded its design criteria *or* when the capability of the tower has been drastically lowered due to poor or no maintenance *or* that an exceptional weather event has just exceeded its design parameters even on an instantaneous basis.

Our Fact #4 definition also includes the most unfortunate overstressing event which is a rigging accident, where during maintenance or installation a critical stress point on the tower is exceeded by the effort of the riggers and a tower failure is precipitated.

Plan for Ice-Loading

Another stress failure is when the tower is not fabricated to the design criterion or when defective or lesser strength materials are substituted without the knowledge of the user, and the capability of the tower is notably less than the design. In this case, overstress comes at a much lower point than anticipated.

A Complete Inspection

Fact #5: When a failure occurs, *everything* involved in that failure is suspect until determined otherwise, and this includes the anchors, footings, base, guylines, what-have-you. A careful inspection and survey is needed before you can reuse surviving assets.

Among other items, anchors have to be inspected, stress tested and surveyed. Insulators have to be carefully inspected. Threads on turnbuckles have to be carefully examined to make sure that high stress did not flatten them, etc., etc. Even if there is the smallest scintilla of doubt – replace it.

(Continued on Page 32)

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Tower Topics

– Continued from Page 30 –

Fact #6: Tower fabricators do not "stock" towers. If your station tower is greater than 24 inches in face width and more than 200 feet high, it is highly unlikely that even the best vendors will have sufficient material on hand to quickly supply you with a new tower. If they do have an immediate solution for you, it is undoubtedly because they shipped you someone else's tower that was ready for delivery or have a refurbished used tower available. Most often, they will have to acquire the material and fabricate it like any other tower order. Be prepared to wait if you want a specific new tower of any consequence.

Patience

Fact #7: Concrete takes, on average, a week to set up to 50% bearing strength and four weeks to come to full strength. You can improve these numbers a little by using special add mixtures and drying techniques, but you *cannot* just pour and go.

Fact #8: There are firms that do emergency restorations, *but* these normally are for shorter microwave towers. Ordinarily you need to make advance arrangements, which amounts to an insurance policy of sorts and this is very expensive. If weather took you out, it probably took others out in the same region, which questions the availability of these temporary towers. Further, they have to get to you and your site! A better temporary arrangement is on an alternative high point like a building or other nearby tower or a portable crane (for FM) or a long wire for AM. The more you want to control the situation, the more advance planning you should do, and as a result, the less expensive it will be if disaster ever strikes.

With the above as preamble, next time we will begin to design a tower for a typical broadcast installation so that you can see how the design flows from loads and location. *– Radio Guide*

What to do if you have a weather-related tower failure?

It is the call any engineer dreads. "The tower is down! We're off the air! What do we do now?"

Documentation

First of all, determine exactly at what time the failure occurred. Tuesday evening is not exact. Tuesday evening at 2331 Eastern Standard Time is exact. Unless you have been through one of these, you do not know how much having an exact time simplifies the matter.

Contrary to your first impulse, your first big goal should be to document the loss – not to get the station back on the air. If your tower is down, you will be off for a long time and so your first priority is to establish the extent and cause of the loss to make sure your insurance carrier pays their fair share. This includes not only the physical loss but also the "disruption insurance" if you have it. Additionally, this documentation makes sure that you only have to bear your fair share of the blame – if there is any for you to bear.

Visual Records

Take pictures immediately, using some sort of numbering scheme to keep a written track of what they are, as well as the angle and time the picture was taken.** Also roll video if at all possible, shooting lots of long, slow pans (for spatial orientation) and then push-ins to particular items of consequence.

If ice brought down the tower, get a picture of the biggest piece of ice that you can find with a ruler next to it. Once that ice has melted, it is your word against everyone else's that there was 2 inches (or whatever you had) of ice on your tower! Try to be logical and methodical in your pictorial effort so the proof can easily be seen right there in front of the viewer.

Obtain validated copies of the nearest reporting station's weather ASAP and try to obtain any first hand reports from "sky watch" people and pilots who might have been in the area and have a recollection of "gusts or funnel clouds, or ice forming, etc." Download animated weather radar displays as additional proof. Memories dim, exact times are forgotten, detailed data gets blown away and then it is very hard to prove even basic premises of your claim.

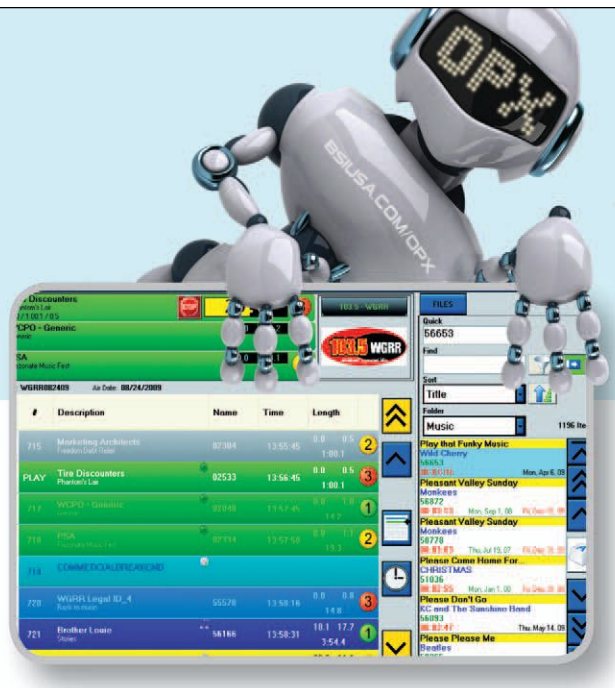
Secure the Site

Secure the site immediately, even if you have to hire private police until it can be inspected by your carrier, and OSHA (if needed) – and to make sure that "gawkers" or souvenir hunters do not walk off with critical items of evidence. On top of everything else, these catastrophe sites are downright dangerous. For example, energy stored in still connected but highly overtensioned guy lines at ground level can cause them to snap unpredictably. There is enough energy released when this happens to cut a person in half like a razor whip.

Another hazard is sharp steel torn edges of sections driven in the ground that may be under snow or mud. These can do horrendous damage to people's feet when they slice or penetrate through shoes or boots. It is just good sense to keep everyone out of the site until a full assessment can be made by people who know how to do it safely and accurately.

Once this CYA exercise is done, you can begin to get your station back on.

*** Each of us should keep one of those "disposable" cameras in our vehicle glove compartment at all times. It is a great stimulator to keep everyone honest at any accident event, as well as a super backup for when pictures are needed on an immediate basis.* *– Radio Guide –*



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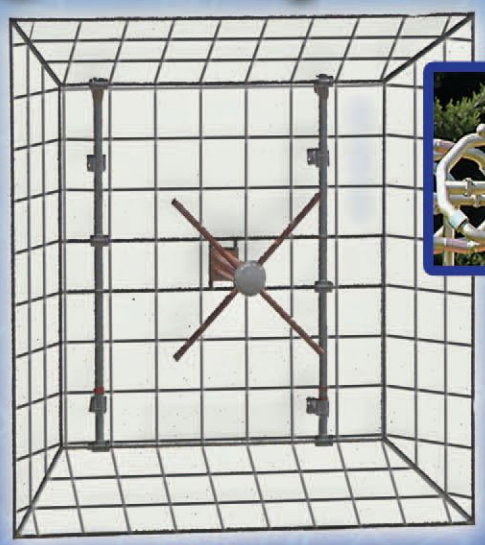

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Tech Management

Budget Time Already?

by Mark Mitchell

This year is almost over, and time to start planning for next year's budget. Wait ... I can already hear some of you saying, "Plan for next year? I haven't even finished *this* year's budget!"

Looking Far Enough Ahead

I know that this might seem like a silly idea but, like any other long term project, planning is the key. And whether you work in a large market or a small market, now is the time to start making plans and planting ideas for the future.

While some of these ideas can be used for both Capital as well as Operating budgets I am going to focus on Operating budgets here. Although a lot of this can be considered basic, it is amazing how many engineers not only do not plan for budgets, but do not have the steps in place that will make it easier to create budgets easily and in a timely manner.

Instead, most of us just throw together something at the last minute, usually consisting of bumping up the numbers from last year, the three to four percent that is allowed across the board. This is not only ineffective but also inefficient. What I would like to do is to show you an overview of some things that help me not only prepare my budget, but also prepare my management for the recommendations I make in my budget.

Building the Wish List

As you go through the year, you and your workmates will have thoughts and ideas of things that you would like to change or accomplish. But as we get busy just doing the day-to-day tasks, those ideas get lost or forgotten. I have found one of the best ways to help me remember is to start each year with a sheet of paper, a computerized task list, an erasable wall-board, or some other place where I can write down the ideas as they come to me.

This serves a couple of purposes. The first is that I do not forget the idea. The second is so that, down the road, I can re-evaluate the idea to see if it is still feasible. Often times it will spur my thoughts to other related items that I had not thought about at the time. And finally, it gives me a yearlong list to work with when the budget process begins.

The nice thing about this list is that you can be as outlandish as you wish. Do you find you need an additional person? If you have it on your list, you can take the opportunity throughout the year to document the occasions where having that extra person would have saved you money by reducing the time a station was down.

What about those occasional projects that need to be done – like having bees removed from a transmitter site? You can document the time of year that the problem occurred, and whether or not you had the same problem the previous year. You can also use this list for big projects that occur every few years such as painting a tower, building, or making major fence repairs that you can see will be needed.

You should also prepare for any larger ticket items that you may need, such as a spare tube – because you never know when a lightening strike or power surge is going to take out the one you just put in. Whatever you feel the need is, as you think of it or come across it, put it down on your list.

Packing It In

"But wait," you say, "If I do that, my list is going to be bigger than the three volumes for my transmitter!" And I say, "that's okay." Remember, the list is just going to be used as a guide for when you start putting your budget down on paper.

This year's list has been started; it already includes items like backup links for my STL and new tower light sensors. I put the tower light sensors on thelist, because when I looked at the ones I had inherited, I saw that most of them were pretty old and was unsure how reliable they were.

That is another important aspect of this list. Use it to put down items that need to be replaced due to obsolescence. Even as technology changes rapidly, the reliability of our stations is of paramount importance. We need to make sure we have the technology that suits our stations best and makes our jobs as worry free as possible. After all, we have personal lives too. (Of course, this excludes those engineers that seem to live at the station!)

Another area that you do not want to forget is safety. This means items such as fire extinguishers and their annual service. If your sites are like mine were, the fire extinguishers may not have been serviced in five to ten years.

You should have an extinguisher in your generator room, and one or two in your transmitter room. Make sure you have the correct type for electrical fires. Even if you have a fire suppression system installed in the building, having a couple of extinguishers handy could take care of something small before the larger system goes off, and save you several hundreds of dollars.

Also for safety, make sure that you remember items like hearing protection, eye wash stations, mud mats, stepping

(Continued on Page 36)

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Tech Management

– Continued from Page 34 –

stones or gravel – as well as items like gloves, face (breathing) mask, and eye protection. Think about the ladders that you have. Do they present some type of risk to the user? For instance, aluminum ladders should not be used at transmitter sites. Do you have lock-out/tag-out kits? With the increase in liability when you have contractors on site, these types of items are not only desired, but they are needed to protect the station from lawsuits.

Deletions / Additions

As you create this list, indicate items you may have had in the budget in previous years but no longer need. For example, if you just got a new solid-state transmitter, make a note to delete "replacement tube."

At the same time, you also need to make sure you budget for a replacement or spare solid-state module, as well as for repairs to one or two modules. Face it – at least one of them is going to blow up at the most inconvenient time during the year. You surely do not want to tell your GM you need to spend two to three thousand dollars – and spend several days or weeks repairing a module – to get you back to full power during ratings.

Consider the tools you use for the studio. Do you have what you need or are you just trying to make do with what you already have? What about extra cable and connectors to replace ones that die? Have you thought about what you are going to do if one of your microphones goes out?

Prepare the GM

These are just some of the types of items that you need to consider putting on your list. But there is something more that you need to consider while you are putting this list together. As you add items to your list throughout the year, take the opportunity to let your GM know. Present it to him while it is fresh in your mind.

Tell him you do not have to have the item immediately, but it is a department or station need you want to put into the budget for next year. Then when you bring it back up, you can refer to the earlier conversation. And since it will not be a surprise, he is more likely to accept it and help keep it from being cut during budget reviews.

As you talk about these budget items with your GM, frame them in a way that shows why they are needed. Explain how a particular item, service or repair will save the station money in the long run.

For example, you may want an annual service contract for a generator you have been servicing yourself. Explain the benefits and cost reduction factors and/or reliability/down-time issues. Let the GM know that when you have to perform this type of work yourself, it takes time away from keeping the studio and transmitter at their most efficient operating states.

Remember, the better prepared you are to show your GM how something will increase revenue, reliability, and ratings, the easier time you will have keeping that item in the budget.

Sure, I can hear some of you saying, "How does getting my generator serviced by someone else increase revenue, reliability or ratings?" Consider this: if you have a professional perform even the routine maintenance on your generator, they are likely to spot potential problems that occur with that particular generator, of which you may not be aware.

This *will* increase reliability, as you will be less likely to have a generator failure when it really counts – such as in the middle of morning drive. As you well know, that is exactly when old Murphy will stick his head in to cause a problem. Instead of disaster, when the power goes out in the middle of ratings you will be on the air with the scoop on the biggest thing going on in your area.

Budget Time

After you have taken these steps throughout the year, the day finally comes when you will have to put it all together to present a budget. If you have written down some type of justification as you saw it at the time, this part should be a lot easier, and the budget you present will be much better.

Start by going through the entire list. Do this several weeks before the budget process actually begins. Take a few minutes to evaluate each item. Ask yourself if that item, and the reasons behind adding it, are still valid. Because circumstances change throughout the year, there will be items you will look at and immediately decide they can be stricken from the list.

Once you have eliminated what you believe is unnecessary, schedule a little bit of time with your GM and go through the remainder of the list. This will accomplish a number of things.

One is to refresh your GM with items that you had casually mentioned to him previously. Two, it will give the two of you a chance to go over all the items when you are not pressed for time. Three, your ideas may prompt him to suggest items that you had not thought about. Finally, you will have the opportunity to make any adjustments the two of you come together on.

Now lest I forget, there is one other person/department that you want involved with this process – the Business Manager.

The Business Manager can help you put together the numbers to show the cost savings/benefits. Many times they can help you with the presentation of an item so it will most likely make it through the budget cutting process. If you can make changes in your budget that will make it easier for them, such as having a bill from one vendor instead of several bills from multiple suppliers, they are more inclined to help push through your ideas.

Try these suggestions; you will find the budget process can be made easier when you take the time to plan ahead and involve others in this process all through the year. *– Radio Guide –*

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LPFM Guide

LPFM: Ready, Set, Go ... Stop

(Ready, Set, Go ... Stop ... Ready, Set, Go)

by Leo Ashcraft

It's been a wild LPFM window this time around! The filing window was scheduled to open on October 14. Our staffers were working 18-20 hours a day prior to the window, working with clients to collect necessary information, documents, create the engineering, and input everything into the CDBS. The government shutdown was looming and we had no idea how that would affect the filing window – if at all.

We expected a possible delay of the window. What we didn't expect to find was the Commission's CDBS filing system and all electronic services disabled for absolutely no reason! FCC reports stated that 17 staffers would stay on in the IT department, and the interim chairwoman would remain on staff as well. But at midnight on the 15th, the systems came crashing down like a child taking away the gift they gave you because they were mad at you for something. Yet the staff was there to maintain everything.

But we're past that now – the date for the filing window opened. The government was shut down, so we were forced to find alternate methods to continue our customers engineering. Then we couldn't input anything into the CDBS because it had been disabled. So we went back to paper, to be put into the CDBS when the government reopened.

Hello is Anyone Home?

October 15th – no word from the temporary chairwoman on what the plans were for the LPFM filing window, in regards to the shutdown. October 16th – again no word from her regarding what the plans were for the window. October 17th – again, silence. Finally late in the evening, maybe October 18th, they said the filing window was open and had *been* open! I had one lady in the PR office tell me it had been open since the 15th! I told her that was impossible, as the CDBS was shut off the evening of the 14th!

So we had lost some critical time – the two weeks leading up to a filing window are *very* critical. We had lost that, and we had lost three days of the actual filing window – but still no word from the FCC on how they were going to handle this. Well, that was about all I could stand, so I rallied the allies and within 24 hours we had convinced the Commission it would be best to extend the window until November 14.

Back to Work!

OK, we're now back in business. We got our two weeks that were lost and could resurrect the momentum. Of course everyone likes to wait until the last week or two to call us about their new application they want us to prepare and file. Really, we literally get more calls in the last week than any other time. And even on the next to last day and the day of the filing! They just don't seem to understand we can't put together everything they need in a few hours. (In some cases we can – but its rare.)

Appreciative / Unappreciative – What a World!

The last day I spent assisting pro-bono clients who had either self-prepared and made severe errors on their apps, or ones we had been working with previously. I love helping people who really need the help but, you know, something has really changed in today's society. Only one client thanked me and seemed authentically appreciative of the work I had done for them without charge. Accolades to Audrey and the best of luck to you!

OK, back to the window now. We're chugging along just fine and by the 12th we had the majority of the applications for paid clients filed. We had a few stragglers on the 13th, but the Commission's CDBS was showing signs of stress due to the fact that even attorney's filing apps for clients wait until the last day, or day before the deadline, to file the majority of their clients' applications. I don't understand this thinking, and this practice can overload the Commission's CDBS filing system.

DC, We Have a Problem!

By the morning of November 13th, it was taking two to five minutes to go between screens or submit the application. To speed up our processing we utilized several different browsers. Each had a different CDBS account open where we would input the data, hit submit, and go to the next browser and repeat. By the time we got back to the original browser it was just about done submitting the data. Sometimes it would just time out, or spew various server and MYSQL errors, etc. Many times we would have to start over.

(Continued on Page 40)

LPFM: Ready, Set, Go – Stop ...

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It was reminiscent of the last three days of the 2003 translator filing window. But we were done with paid clients and just trying to help pro-bono clients at this point. We contacted the Commission, who seemed unconcerned and surprised that anyone would file on the last day – and sort of, well, "you kinda deserve that for waiting till the last day" type of attitude. Tell all the communications attorney's that too please. I only had five to help with on that day and, had it operated properly, I could have completed that in just an hour. Instead it took me all day – eight hours. Finally in the last 30 minutes, a Commission staffer alerted me to a public notice just released which would extend the filing window until November 15th at 3:00 p.m. EST.

You could see the pressure and stress roll off like a light switch had been flipped. We all stopped what we were doing, then left and came back a few hours later to finish the filings. But what a nightmare! In 2003 we experienced this in the last three or four days of the filing window and had paid clients apps at stake! Similarly, they had little concern over the failure of the filing system and we had to put together a quick petition to the commissioners to get the window extended for the three days it didn't function properly.

Filing Window History

The reason for the filing windows is to prevent people from holding your application hostage for a fee. In the past, prior to filing windows, one could apply for a new station at any time. They would open an a window, which basically let people know someone was applying in a specific area and frequency. This would give anyone else an opportunity to file an application as well for that area and frequency. Next, came window B, where petitions to deny could be filed. And finally, with no complaints or multiple applicants, the FCC would eventually grant your construction permit.

OK, all well and good you say? Here's the problem. Some jerks out there decided it would be a good idea to watch the daily digest and simply copy your engineering data (which you paid an engineer to complete). They would then input that data into their own form, changing only the names and addresses – everything else stayed the same. Although they weren't interested in getting a station in Podunk Kentucky, they would gladly drop their application for say $10,000. Get the idea now? This is what caused the solution we call filing windows.

Filing windows obviously have other big problems though, they are few and far between – the LPFM filing windows were thirteen years apart. The last window for translators was more than ten years ago and the last NCE window seven years ago. It's my opinion that this is also not serving the public interest. I think we had a better solution with the original method – it just needed some adjustments.

AM Translator Window on Horizon

In related news, the Commission is considering opening an AM-only translator window next year. This would be limited to existing AM licensees and CP holders. The FCC is proposing to limit AM stations to one translator, and the translator must rebroadcast the AM station content. In addition, the translator can't be "broken away" from the AM station, and can't be separately sold-off. The FCC is asking how this will impact LPFM. Translators will still be co-secondary with LPFM but they will be able to run as fill-ins and can run up to 250 Watts at any elevation, only limited to an area that is the lesser of 25-miles around the AM station or within the 2mV/m daytime contour.

FCC AM Revitalization Docket ... No Mention of LPAM

The Commission may also be considering an old proposal from 2006 about creating an LPAM Radio service. In the recent Commission's AM revitalization plan, LPAM was not mentioned. Advocates for the service include Don Schellhardt and Nicholas Leggett. Mr Leggett was one of the original petitioners for the LPFM service along with Rodger Skinner. Leggett and Schellhardt plan to file written comments in the FCC Docket 13-249 proceeding and are encouraging the public to do so as well. Deadline for filing comments for or against LPAM are due by December 30th, 2013. You would need to reference the original LPAM proposal from 2006 – RM-11287.

But there are problems with the proposal. The proposal seeks commercial status without being subject to auction. This is likely against the Communications Act and would likely need congressional approval to allow the Commission to consider the proposal. Michi Eyre of Recnet supports a non-commercial version of LPAM, which is a bit more realistic for Commission approval without an Act of Congress. Of course, an Act of Congress is not impossible. Its been done before – for LPFM – and one reason the service is no longer required to protect third adjacent neighboring stations.

Leo Ashcraft is former CEO of Nexus Broadcast "Broadcast Outside The Box!" He is a broadcast consultant with over 29 years engineering experience and an avid LPFM advocate for over 15 years. More information at NexusBroadcast.com or 888-732-3599

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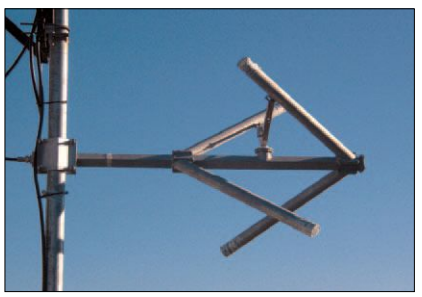

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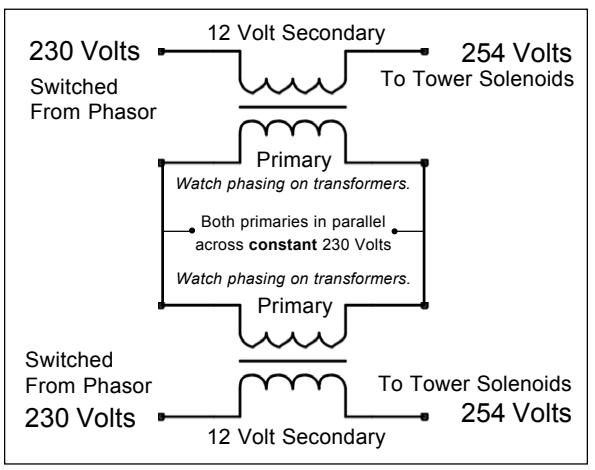
Small Market Guide

The Case of the Failing Contactors

by Roger Paskvan

In many of the AM stations in small marketville, the antennas are directional at night, with a little dog house at the base of each tower. The Antenna Tuning Unit (ATU) in those houses is switched, utilizing large contactor type relays made by Multitronics or some other brand. These contactors consist of two solenoid plungers opposing each other, that rocker the antenna contacts between day and night. So twice a day, these large rocker contactors must switch the AM pattern. Many of us are living with buried #14 wires to each tower – and probably are still using those same old decaying wires. In our case, these wires were installed in 1975!

Our station would end up losing one or more of the contactors every year. This would naturally occur in the dead of winter – a numbing -20 degrees for us – the most inconvenient time to work in those nice, cold tower shacks. I assumed that the cold weather and frozen grease made the contactor vulnerable to failure – a bad solenoid had to be replaced. For a number of years, we ordered expensive replacement solenoids from Multitronics, until one day I realized that most of these solenoid parts could be obtained from Sears or Grainger, since these solenoid coils are the same type utilized in wash machines. This factor brought our costs down by 60 percent. However, it remained that every time we had a failure, we were still off the air, we were cold, and it was quite a job to replace those parts.



AC Boost Circuit

By making actual AC voltage measurements during the switch, it became apparent that the voltage applied to the solenoids was low in each tower building. The 230 Volts leaving the phasor was reduced to 208 Volts at the contactors. The voltage drop must have been in the old wires and buried connections. Wire replacement was not an easy option, considering the buried radials and the 1,000 foot runs to each tower.

If it would only be possible to just add voltage to the solenoid AC feed circuit – like batteries in series.

The AC solution that worked was to add two transformers in series with the wires going to the towers. I chose two 12 volt transformers and placed one in series with each side of the 230 Volt AC source going to towers within the station phasor rack. This brought the AC voltage feed up to 254 Volts. On the far tower end, I was amazed that my voltage at the solenoids under load was now 231 Volts. The contactors were happy again, and switched very quickly. The old days of buzzing and a slow throw were gone – those contactors were full of life.

If you're going to make this modification to your phasor, here are some tips:

1. Measure your exact line voltage loss under switch load at each tower. This will vary with each station, since the line distance from your building to the towers is a variable. You may need a higher or lower voltage boost.

2. Confirm at the switcher phasor output, the AC current that all of your contactors together are drawing at switch time from this source. (In our case it was 9 Amps, so we oversized to a 15 Amp transformer.)

3. Before ordering new transformers, make sure they are rated at the AC line voltage primary and at the overrated secondary current that your contactors need from the source. (In our case, 230 Volts / 12 Volts @ 15 Amps.)

It's been 15 years since this modification, and I must say our solenoid failure rate is down to one every 3-4 years depending on lightning. It does the trick and saves a buck – so important in today's small market radio.

Roger Paskvan is an Associate Professor of Mass Communications at Bemidji State University, Bemidji, MN. You may contact him at: rpaskvan@bemidjistate.edu

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